PRODUCT MANUAL

G-Technology®

G|SPEED STUDIO XL with Thunderbolt™

Hardware RAID 8-Bay Thunderbolt™ 2 Storage Solution

g-technology.com

Table of Contents

Safety & General Use

Safety Precautions 5
Backup Your Data 6
Make Two Backups 6

About Your G-SPEED Studio XL

Introduction 8
What's in the Box 9
System Requirements 9
Overview of the Drive 10

Using Your Drive

Drive Activity LED 12
Warning LED and Alarms 13
Disconnect the Drive 14

Configuring G-SPEED Studio XL

G-Technology Assistant 17
Recommended Installation 17
G-SPEED Studio Software Utility 18
Power Modes on G-SPEED Studio XL 22
Shutting Down G-SPEED Studio XL 22
Daisy Chaining Multiple G-SPEED Studio XL Units 23
Displaying Multiple G-SPEED Studio XL Units 25
Manage the Enclosure with G-SPEED Studio Software Utility 25
Accessing the G-SPEED Studio Software Utility 26
Unlocking the UI 28
G-SPEED Studio Software Utility Overview 29
Toolbar Icons 30
Customizing the Toolbar 30
Component List 31
Physical Drive Menu 31
Highlight Arrays 32
Managing System Information 33
Viewing System Information 34
Making System Settings 34
Clearing Statistics 35
Restoring Factory Default Settings 35
Saving a Service Report 36
Updating Firmware 36
Managing Enclosures 37
Viewing the Enclosure Information 37
Viewing Temperature Sensor Information 38
Locating an Enclosure 39
Managing the RAID Controller 39
Viewing Controller Information 39
Viewing Controller Statistics 41
Changing Controller Settings 41
Changing Buzzer Settings 42
Managing Background Activities 43
Viewing Current Background Activities 43
Viewing Scheduled Background Activities 44
Adding a Scheduled Background Activity 44
Changing Background Activity Schedule 45
Enabling or Disabling a Scheduled Background Activity 47
Deleting a Scheduled Background Activity 47
Media Patrol 48
Changing Media Patrol Settings 48
Redundancy Check 48
Changing Redundancy Check Settings 49
Initialization 49
Changing Initialization Settings 50
Rebuild 50
Changing Rebuild Settings 51
Migration 51
Changing Migration Settings 52
PDM 52
Changing PDM Settings 53
Transition 53
Changing Transition Settings 54
Synchronization 54
Changing Synchronization Settings 55
Managing Physical Drives 55
Viewing a List of Physical Drives 56
Viewing Physical Drive Information 56
Viewing Physical Drive Statistics 58
Viewing Physical Drive SMART Log Information 59
Locating a Physical Drive 59
Changing Global Physical Drive Settings 60
Changing Individual Physical Drive Settings 60
Changing Physical Drive SMART Log Settings 61
Clearing a Stale or PFA Condition 62

Table of Contents

Running Media Patrol on Your Physical Drives 63
Managing Disk Arrays 64
Viewing a List of Disk Arrays 64
Viewing Disk Array Information 65
Creating a Disk Array Manually 65
Creating a Disk Array and Logical Drive With the Wizard 67
Choosing Automatic Configuration 68
Choosing Express Configuration 69
Choosing Advanced Configuration 71
Formatting Your Logical Drives 73
Changing Disk Array Settings 73
Locating a Disk Array 74
Deleting a Disk Array 75
Preparing a Disk Array for Transport 76
Rebuilding a Disk Array 76
Pausing and Resuming a Rebuild 78
Stopping a Rebuild 78
Managing Logical Drives 78
Viewing a List of Logical Drives 79
Viewing Logical Drive Information 79
Viewing Logical Drive Statistics 80
Changing Logical Drive Settings 81
Viewing Logical Drive Check Tables 82
Creating a Logical Drive Manually 82
Formatting Your Logical Drives 84
Locating a Logical Drive 84
Deleting a Logical Drive 85
Initializing a Logical Drive 85
Pausing and Resuming an Initialization 86
Stopping an Initialization 86
Redundancy Check on a Logical Drive 87
Pausing and Resuming a Redundancy Check 87
Stopping a Redundancy Check 87
Migrating a Logical Drive 88
Running PDM on a Logical Drive 89
Pausing and Resuming PDM 89
Stopping PDM 89
Managing Spare Drives 90
Viewing a List of Spare Drives 90
Viewing Spare Drive Information 90
Creating a Spare Drive Manually 91
Changing Spare Drive Settings 92
Running Spare Check 93
Deleting a Spare Drive 93
Running a Transition on a Spare Drive 93
Running a Transition 94
Pausing and Resuming a Transition 94
Stopping, Pausing or Resuming a Transition 94
Formatting Logical Drives 95
G-SPEED Studio XL Software with Default Settings 95
G-SPEED Studio Software Utility with Custom Settings 96
Disk Utility 97
Spare Drives 98
Running a Transition 99

Maintenance for Your Drive

Replace a Failed Disk Drive 101
Initialize Drive for Mac® 103
Restore the Drive Icon 106
Reformat with Partitions 108

Appendix

RAID Levels Explained 113

Support & Warranty

Technical Support 115
Limited Warranty 116
Limited Warranty 116
Copyright 118

G|SPEED® STUDIO XL
with Thunderbolt™

Safety & General Use

- Safety Precautions ..... p. 5
- Backup Your Data ..... p. 6
- Make Two Backups ..... p. 6

G-Technology®

Safety Precautions

Your G-SPEED Studio XL's warranty may be voided as a result of failing to respect the precautions listed below. If you detect a problem with your drive, please contact our Technical Support department.

If the product is returned with damage caused by improper handling, the warranty will be void and liability will rest with the user. Please read our Limited Warranty.

- **Servicing:** Your drive contains no user-serviceable parts. If it appears to be malfunctioning, have it inspected by a qualified Technical Support representative.
- **Moisture:** Place the device away from moisture or liquids. To reduce the risk of damage, do not expose this drive to rain or moisture. Do not use it in damp or wet conditions. Never place objects containing liquids on the drive as they may spill into its openings.
- **Ventilation:** Place the device in a vented area. The drive should never be placed near or over a radiator or heat source.
- **Temperature:** Do not expose this drive to temperatures outside the range of 5°C to 35°C (41°F to 95°F). It should also not be exposed to operational humidity beyond 5% to 80% (non-condensing) or non-operating humidity beyond 10% to 90% (non-condensing). Avoid placing your drive near a source of heat, exposing it to sunlight (even through a window),or setting it in an environment that is too cold or humid.
- **Physical Damage:** Do not place heavy objects on the drive. Never use excessive force on your drive.

Backup Your Data

The disk drive contained in your G-SPEED Studio XL is a delicate electronic instrument and is susceptible to damage from excessive physical shock. Under no circumstances will G-Technology be held liable for the recovery or restoration of lost data. Any loss, corruption or destruction of data while using a G-Technology drive is the sole responsibility of the user.

Make Two Backups

To help prevent the loss of your data, we highly recommend keeping TWO copies of your data in separate storage locations. When configured in RAID 1, 1E, 5, 6, 10, 50 and 60; G-SPEED Studio XL will safeguard your data from individual hard drive failure. However, if any file system corruption occurs, the data contained on G-SPEED Studio XL may be affected.

For critical data, G-Technology recommends keeping one copy on your G-SPEED Studio XL and at least one additional copy on another storage device.

G|SPEED® STUDIO XL
with Thunderbolt™

About Your G-SPEED Studio XL

- Introduction ..... p. 8
- What's in the Box ..... p. 9
- System Requirements ..... p. 9
- Overview of the Drive ..... p. 10

G-Technology®

Introduction

Thank you for purchasing the G-Technology G-SPEED Studio XL, featuring 20 Gb/s Thunderbolt 2 interface technology.

Specifically designed for professional content creation applications, the G-SPEED Studio XL storage system provides RAID 0, 1, 1E, 5, 6, 10, 50, 60 and JBOD functionality for both application performance and data protection. The drive supports Thunderbolt 2™ technology which enables blazing fast, concurrent data streams, capable of data transfer rates over 1300 MB/s. This opens up incredible time-saving and multi-stream possibilities for content creation professionals who use bandwidth-intensive 2K and 4K media formats.

With two bidirectional ports, a user can easily daisy chain up to six high-speed Thunderbolt peripheral devices, including external disk drives, video capture devices and external displays. Thunderbolt 2 is backward compatible with the previous, first-generation version of Thunderbolt.

G-SPEED Studio XL supports the industry's most demanding professional content creation applications, including Final Cut Pro®, Adobe Premiere® and Avid™ Media Composer.

What's in the Box

The following items are included in the box:

- G-SPEED Studio XL storage solution
- Eight removable Enterprise-class drive modules (installed in unit)
- (1) Thunderbolt cable
- Power Cord
- Quick Start Guide

If any items are missing, please contact G-Technology at
www.g-technology.com/contact/contact_support

Download the latest G-SPEED Studio XL manual and utilities at:
www.g-technology.com/support/gspeed_studio_xl

System Requirements

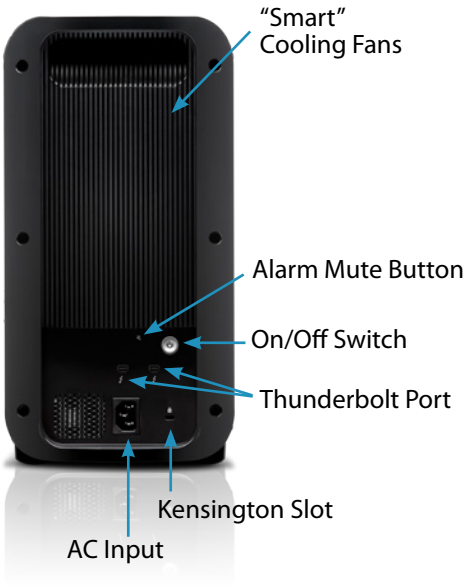
G-SPEED Studio XL supports the following operating systems:

- Mac OS® 10.9.2 or higher

The solution is set up at the factory for use with Mac OS® X systems and is formatted as "HFS+" in a RAID 5 configuration.

Overview of the Drive

G-SPEED Studio XL ships from the factory preconfigured in RAID 5. The RAID controller also supports Protected RAID modes on XL: RAID 1, 1E, 5, 6, 10, 50 and 60. For an explanation of these RAID levels, please refer to RAID Levels Explained. If you wish to change the RAID mode, please refer to Change the RAID Mode.



G|SPEED® STUDIO XL
with Thunderbolt™

Using Your Drive

- Drive Activity LED ..... p. 12
- Warning LED and Alarms ..... p. 13
- Disconnect the Drive ..... p. 14

G-Technology®

Drive Activity LED

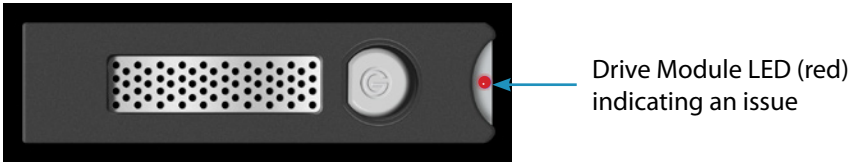
Under normal operation, each G-SPEED Studio XL drive module has an LED that glows blue, indicating a connection to the RAID controller. The LED will flash when the drive is being accessed.

Warning LED and Alarms

The G-SPEED Studio XL enclosure integrates an audible alarm or buzzer that will sound when any of the following conditions exist:

- Internal temperature exceeds a temperature of 60°C.
- Main cooling fan fails
- Fan slows to a state where the fan can no longer adequately cool the system
- To silence the alarm, push the Alarm Mute button located on the back of G-SPEED Studio XL as shown at below.

- In addition to the audible alarm, the LED located on the front G-SPEED Studio XL will illuminate red.
- If there is an issue with a G-SPEED Studio XL drive module, the LED on the module will glow red indicating a drive or RAID issue. Please launch the G-SPEED Studio Software Utility to determine if any user action is required or contact our support team for further troubleshooting.



Alarm Mute button

If you hear an audible alarm and see the red warning LED on G-SPEED Studio XL front, stop using the enclosure and contact G-Technology support.

Disconnect the Drive

A great feature of Thunderbolt technology and G-SPEED Studio XL is the ability to connect and disconnect the system while your computer is running. To prevent drive failures and/or data loss, it is important to follow the steps below when disconnecting or unmounting the drive from your computer.

1. Before powering down and disconnecting the drive, unmount the system by simply dragging the G-SPEED Studio XL icon to the trash located in the system dock.

Keyboard shortcut: Select the drive icon and press Command+E.

2. It is safe to remove the drive from your system when the drive icon is no longer present on your desktop.
3. To power off G-SPEED Studio XL simply unplug the Thunderbolt cable. If no background activities are in progress, the unit will automatically go into standby.

G-SPEED® STUDIO XL
with Thunderbolt™

Configuring G-SPEED Studio XL

- G-Technology Assistant ..... p. 17
- Recommended Installation ..... p. 17
- G-SPEED Studio Software Utility ..... p. 18
- Power Modes on G-SPEED Studio XL ..... p. 22
- Shutting Down G-SPEED Studio XL ..... p. 22
- Daisy Chaining Multiple G-SPEED Studio XL Units ..... p. 23
- Displaying Multiple G-SPEED Studio XL Units ..... p. 25
- Manage the Enclosure with G-SPEED Studio Software Utility ..... p. 25
- Accessing the G-SPEED Studio Software Utility ..... p. 26
- Unlocking the UI ..... p. 28
- G-SPEED Studio Software Utility Overview ..... p. 29
- Toolbar Icons ..... p. 30
- Customizing the Toolbar ..... p. 30
- Component List ..... p. 31
- Physical Drive Menu ..... p. 31
- Highlight Arrays ..... p. 32
- Managing System Information ..... p. 33
- Viewing System Information ..... p. 34
- Making System Settings ..... p. 34
- Clearing Statistics ..... p. 35
- Restoring Factory Default Settings ..... p. 35
- Saving a Service Report ..... p. 36
- Updating Firmware ..... p. 36
- Managing Enclosures ..... p. 37
- Viewing the Enclosure Information ..... p. 37
- Viewing Temperature Sensor Information ..... p. 38
- Locating an Enclosure ..... p. 39
- Managing the RAID Controller ..... p. 39
- Viewing Controller Information ..... p. 39
- Viewing Controller Statistics ..... p. 41
- Changing Controller Settings ..... p. 41
- Changing Buzzer Settings ..... p. 42
- Managing Background Activities ..... p. 43
- Viewing Current Background Activities ..... p. 43
- Viewing Scheduled Background Activities ..... p. 44
- Adding a Scheduled Background Activity ..... p. 44
- Changing Background Activity Schedule ..... p. 45
- Enabling or Disabling a Scheduled Background Activity ..... p. 47
- Deleting a Scheduled Background Activity ..... p. 47
- Media Patrol ..... p. 48
- Changing Media Patrol Settings ..... p. 48
- Redundancy Check ..... p. 48
- Changing Redundancy Check Settings ..... p. 49
- Initialization ..... p. 49
- Changing Initialization Settings ..... p. 50
- Rebuild ..... p. 50
- Changing Rebuild Settings ..... p. 51
- Migration ..... p. 51
- Changing Migration Settings ..... p. 52
- PDM ..... p. 52
- Changing PDM Settings ..... p. 53
- Transition ..... p. 53
- Changing Transition Settings ..... p. 54
- Synchronization ..... p. 54
- Changing Synchronization Settings ..... p. 55
- Managing Physical Drives ..... p. 55
- Viewing a List of Physical Drives ..... p. 56
- Viewing Physical Drive Information ..... p. 56
- Viewing Physical Drive Statistics ..... p. 58
- Viewing Physical Drive SMART Log Information ..... p. 59
- Locating a Physical Drive ..... p. 59
- Changing Global Physical Drive Settings ..... p. 60
- Changing Individual Physical Drive Settings ..... p. 60
- Changing Physical Drive SMART Log Settings ..... p. 61
- Clearing a Stale or PFA Condition ..... p. 62
- Running Media Patrol on Your Physical Drives ..... p. 63
- Managing Disk Arrays ..... p. 64
- Viewing a List of Disk Arrays ..... p. 64
- Viewing Disk Array Information ..... p. 65
- Creating a Disk Array Manually ..... p. 65
- Creating a Disk Array and Logical Drive With the Wizard ..... p. 67

G-Technology®

G-SPEED® STUDIO XL with Thunderbolt™

Configuring G-SPEED Studio XL (continued)

- Choosing Automatic Configuration ..... p. 68
- Choosing Express Configuration ..... p. 69
- Choosing Advanced Configuration ..... p. 71
- Formatting Your Logical Drives ..... p. 73
- Changing Disk Array Settings ..... p. 73
- Locating a Disk Array ..... p. 74
- Deleting a Disk Array ..... p. 75
- Preparing a Disk Array for Transport ..... p. 76
- Rebuilding a Disk Array ..... p. 76
- Pausing and Resuming a Rebuild ..... p. 78
- Stopping a Rebuild ..... p. 78
- Managing Logical Drives ..... p. 78
- Viewing a List of Logical Drives ..... p. 79
- Viewing Logical Drive Information ..... p. 79
- Viewing Logical Drive Statistics ..... p. 80
- Changing Logical Drive Settings ..... p. 81
- Viewing Logical Drive Check Tables ..... p. 82
- Creating a Logical Drive Manually ..... p. 82
- Formatting Your Logical Drives ..... p. 84
- Locating a Logical Drive ..... p. 84
- Deleting a Logical Drive ..... p. 85
- Initializing a Logical Drive ..... p. 85
- Pausing and Resuming an Initialization ..... p. 86
- Stopping an Initialization ..... p. 86
- Redundancy Check on a Logical Drive ..... p. 87
- Pausing and Resuming a Redundancy Check ..... p. 87
- Stopping a Redundancy Check ..... p. 87
- Migrating a Logical Drive ..... p. 88
- Running PDM on a Logical Drive ..... p. 89
- Pausing and Resuming PDM ..... p. 89
- Stopping PDM ..... p. 89
- Managing Spare Drives ..... p. 90
- Viewing a List of Spare Drives ..... p. 90
- Viewing Spare Drive Information ..... p. 90
- Creating a Spare Drive Manually ..... p. 91
- Changing Spare Drive Settings ..... p. 92
- Running Spare Check ..... p. 93
- Deleting a Spare Drive ..... p. 93
- Running a Transition on a Spare Drive ..... p. 93
- Running a Transition ..... p. 94
- Pausing and Resuming a Transition ..... p. 94
- Stopping, Pausing or Resuming a Transition ..... p. 94
- Formatting Logical Drives ..... p. 95
- G-SPEED Studio XL Software with Default Settings ..... p. 95
- G-SPEED Studio Software Utility with Custom Settings ..... p. 96
- Disk Utility ..... p. 97
- Spare Drives ..... p. 98
- Running a Transition ..... p. 99

G-Technology®

G-Technology Assistant

To enhance your experience with G-SPEED Studio XL we have developed the G-Technology Assistant (GTA) utility. The utility provides notifications and details on G-SPEED Studio XL as well as a link to the configuration and management utility known as the G-SPEED Studio Software Utility.

The G-Technology Assistant is available for download from the G-Technology website at www.g-technology.com/support. Please visit the site to check for updates as well as helpful tips and tricks.

Recommended Installation

When you first setup G-SPEED Studio XL you will want to install the G-Technology Assistant on your computer along with the G-SPEED Studio Software Utility.

To install the G-Technology Assistant, follow the simple onscreen instructions. Once you have successfully completed the installation, you can access the utility from the Mac OS Menu Bar and/or from the Applications folder.

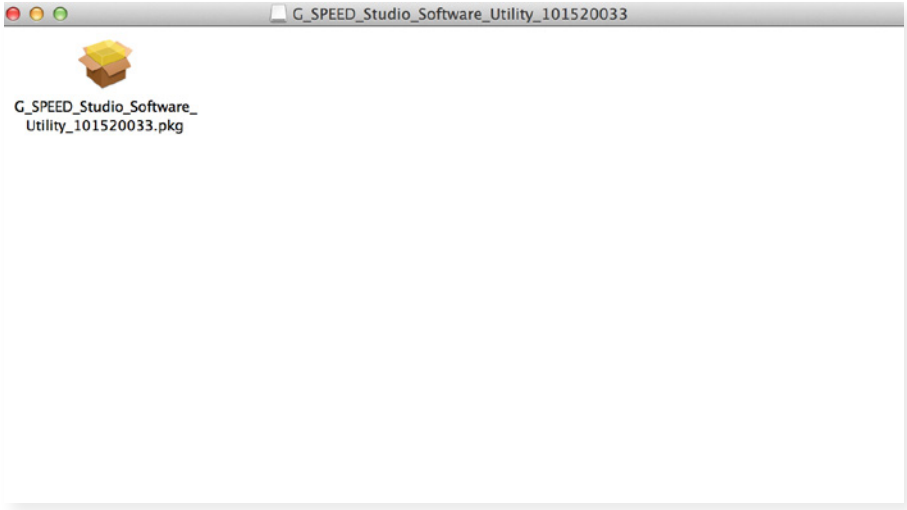
Please visit the **G-Technology Assistant Overview** for general functionality and to optimize the experience with your G-SPEED Studio XL.

G-SPEED Studio Software Utility

G-SPEED Studio XL ships preconfigured in RAID 5 and is ready to use out of the box without configuration. However, G-Technology recommends installing the bundled G-Technology Assistant utility and the G-SPEED Studio Software Utility even if you do not plan to make any changes to device configuration. The applications are useful for monitoring the system and getting firmware updates. Additionally, the utility is necessary if you plan to change the enclosure's default RAID configuration (RAID 5) or if you will swap out any of the pre-installed hard drives.

The G-SPEED Studio Software Utility installation package is available on the G-Technology website and can be easily downloaded. Follow the instructions below to easily install the G-SPEED Studio Software Utility.

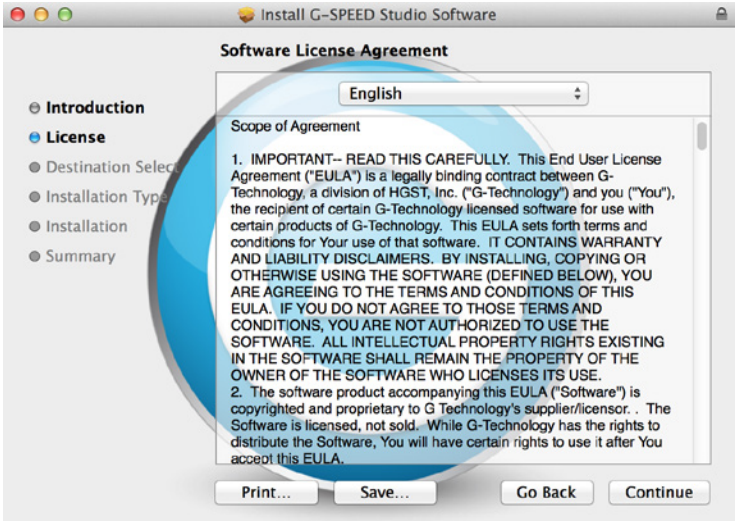
1. Visit www.g-technology.com/support to download the G-SPEED Studio Software Utility.
2. Mount the virtual drive containing the installation software package.*



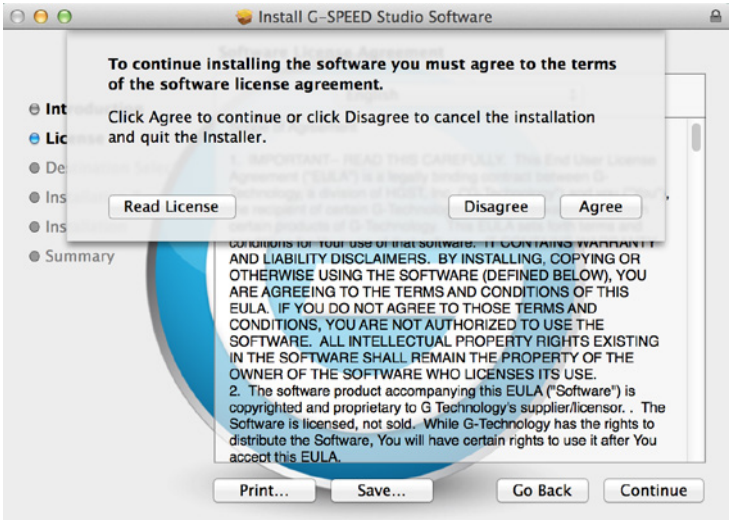
* The version number of the .dmg file and .pkg file will change as it is updated.
The version number used in this example is for illustration purposes.

3. Double-click on the G-SPEED_Studio_Software_Utility.pkg* file to begin the installation.

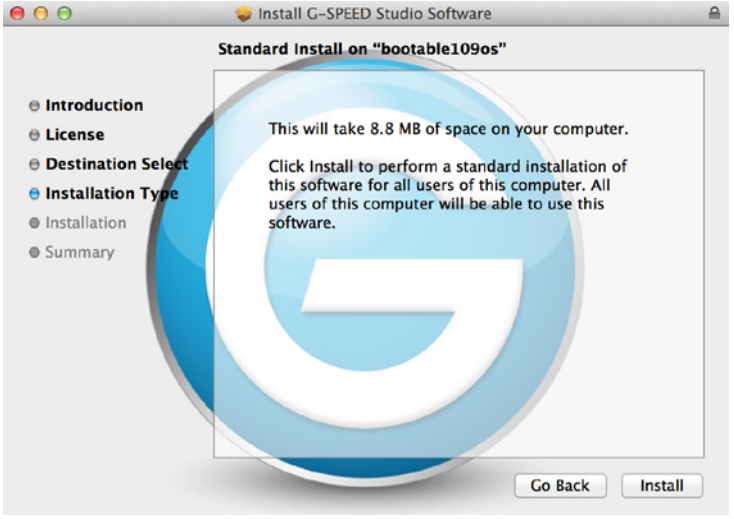
The introduction window explains that software will be installed on the Mac®. You can review the software license agreement. Once ready, click the **Continue** button to proceed.


Install G-SPEED Studio Software
Software License Agreement
Introduction
License
Destination Select
Installation Type
Installation
Summary
English
Scope of Agreement
1. IMPORTANT-- READ THIS CAREFULLY. This End User License Agreement ("EULA") is a legally binding contract between G-Technology, a division of HGST, Inc. ("G-Technology") and you ("You"), the recipient of certain G-Technology licensed software for use with certain products of G-Technology. This EULA sets forth terms and conditions for Your use of that software. IT CONTAINS WARRANTY AND LIABILITY DISCLAIMERS. BY INSTALLING, COPYING OR OTHERWISE USING THE SOFTWARE (DEFINED BELOW), YOU ARE AGREEING TO THE TERMS AND CONDITIONS OF THIS EULA. IF YOU DO NOT AGREE TO THOSE TERMS AND CONDITIONS, YOU ARE NOT AUTHORIZED TO USE THE SOFTWARE. ALL INTELLECTUAL PROPERTY RIGHTS EXISTING IN THE SOFTWARE SHALL REMAIN THE PROPERTY OF THE OWNER OF THE SOFTWARE WHO LICENSES ITS USE.
2. The software product accompanying this EULA ("Software") is copyrighted and proprietary to G Technology's supplier/licensor. . The Software is licensed, not sold. While G-Technology has the rights to distribute the Software, You will have certain rights to use it after You accept this EULA.
Print...
Save...
Go Back
Continue

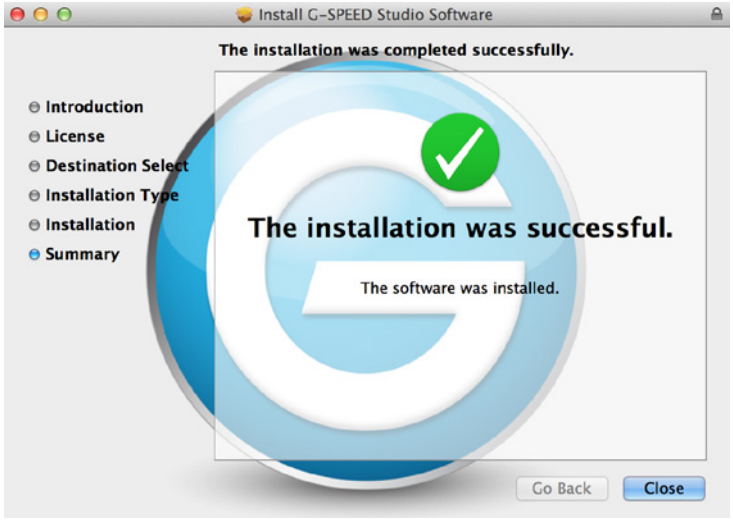
4. The software license agreement will appear. Please read the statement and click Continue to proceed.


Install G-SPEED Studio Software
To continue installing the software you must agree to the terms of the software license agreement.
Click Agree to continue or click Disagree to cancel the installation and quit the Installer.
Read License
Disagree
Agree
Summary
AND LIABILITY DISCLAIMERS. BY INSTALLING, COPYING OR OTHERWISE USING THE SOFTWARE (DEFINED BELOW), YOU ARE AGREEING TO THE TERMS AND CONDITIONS OF THIS EULA. IF YOU DO NOT AGREE TO THOSE TERMS AND CONDITIONS, YOU ARE NOT AUTHORIZED TO USE THE SOFTWARE. ALL INTELLECTUAL PROPERTY RIGHTS EXISTING IN THE SOFTWARE SHALL REMAIN THE PROPERTY OF THE OWNER OF THE SOFTWARE WHO LICENSES ITS USE.
2. The software product accompanying this EULA ("Software") is copyrighted and proprietary to G Technology's supplier/licensor. . The Software is licensed, not sold. While G-Technology has the rights to distribute the Software, You will have certain rights to use it after You accept this EULA.
Print...
Save...
Go Back
Continue

5. Click Agree if you agree to the terms of the license. To read the license, click Read License. Choose Disagree if you do not agree with the terms. This will terminate the installation procedure.


Install G-SPEED Studio Software
Standard Install on "bootable109os"
Introduction
License
Destination Select
Installation Type
Installation
Summary
This will take 8.8 MB of space on your computer.
Click Install to perform a standard installation of this software for all users of this computer. All users of this computer will be able to use this software.
Go Back
Install

6. Click Install to begin the installation process.
7. The G-SPEED Studio Software Utility will install in a few moments. Once complete, a message will inform you that the installation was successful. Click Close to complete the installation procedure.



The G-SPEED Studio Software Utility is now available to help manage your G-SPEED Studio XL. Use this tool if you need to modify the array configuration, retrieve system information or update the enclosure firmware. The utility tool is also useful for monitoring the storage system status as well as troubleshooting. For more information on using the G-SPEED Studio XL, including instructions on how to use the Wizard menu or configure a different RAID array configuration, see **Manage With G-SPEED Studio Software Utility**.

Power Modes on G-SPEED Studio XL

G-SPEED Studio XL introduces new power-saving and condition-response features.

The automatic power features are:

- **Sleep** — When your Mac® computer goes to sleep, G-SPEED Studio XL automatically goes into standby mode after all background activities complete.
- **Wake** — When your system wakes, G-SPEED Studio XL automatically powers on.
- **Shutdown** — When your Mac® computer shuts down, G-SPEED Studio XL automatically shuts down.
- **Restart After Shutdown** — When your Mac® computer powers up, G-SPEED Studio XL automatically powers up.
- **HDD Spin Down** — Your G-SPEED Studio XL includes a power saving feature that spins down the hard disk drives if the enclosure is idle for 30 minutes. This feature can be enabled or disabled, and the amount of idle time can be adjusted in the G-SPEED Studio Software Utility. Click on the **Controller** link in the **Dashboard**, then click the **Settings/Enable HDD Idle Spin Down (Level 3)** button to change this setting.

Shutting Down G-SPEED Studio XL

The storage solution shuts down automatically if you turn off your Mac®. If you want to turn off your G-SPEED Studio XL without shutting down your computer, follow these steps.

1. Eject G-SPEED Studio XL by right-clicking on the drive icon and choosing the Eject option.
2. Launch the G-SPEED Studio Software Utility and click on the System Information tab in the navigation bar. Unlock the user interface (see Unlocking the UI), click on the Shutdown button then click on Shutdown in the new menu that appears. You will need to type "CONFIRM" in the pop-up menu and click the Confirm button.

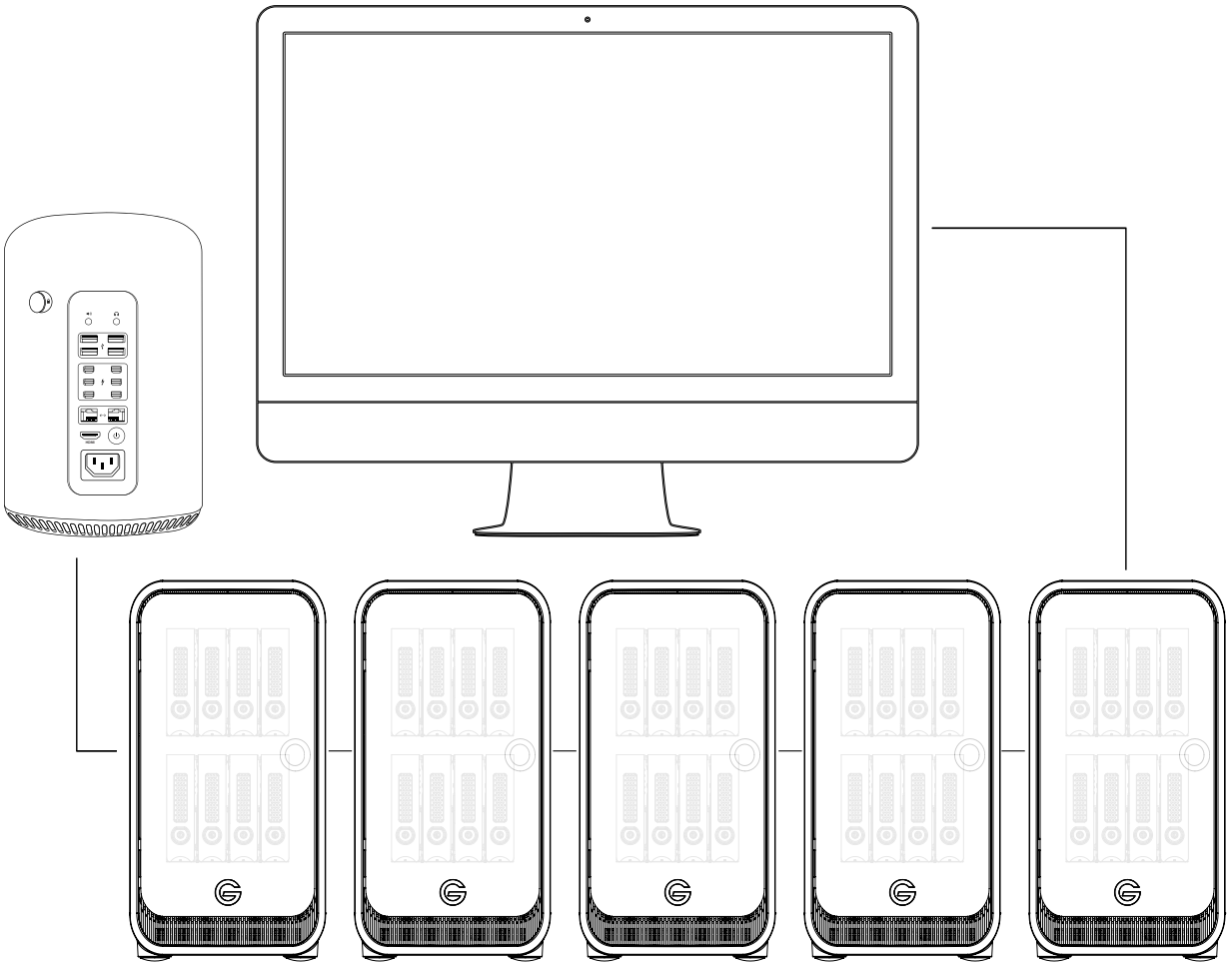
Alternatively, you can press and hold the power button, located on the back of the units, until the LED on the front turns off. When you release the power button, the system will be off and can only be turned on by pressing the power button or removing the power cord.

Daisy Chaining Multiple G-SPEED Studio XL Units

Up to six G-SPEED Studio XL or Thunderbolt-enabled devices can be connected to each other and to your Mac® in a sequential Thunderbolt connection. To daisy chain multiple Thunderbolt devices to your G-SPEED Studio XL, follow these steps:

1. Use a Thunderbolt cable to connect one of the Thunderbolt ports on the back of your computer to one of the Thunderbolt ports on your G-SPEED Studio XL.
2. Use another Thunderbolt cable to connect the second Thunderbolt port on G-SPEED Studio XL with one of the Thunderbolt ports on a second device.
3. Use additional Thunderbolt cables to link subsequent storage enclosures or Thunderbolt enabled devices into the daisy chain via available Thunderbolt ports.

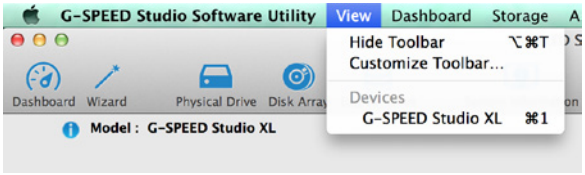
Thunderbolt daisy chain connections



Displaying Multiple G-SPEED Studio XL Units

The G-SPEED Studio Software Utility displays a separate window for each powered up G-SPEED Studio XL unit connected by Thunderbolt.

- To view a list of the G-SPEED Studio XL units, click the View menu.
- To display a G-SPEED Studio XL unit in the G-SPEED Studio Software Utility, go to the **View** menu choose the unit you want to see.



Note that G-SPEED Studio XL units are listed in the order in which they are recognized.

Manage the Enclosure with G-SPEED Studio Software Utility

This section contains the following topics:

1. "Accessing the G-SPEED Studio Software Utility"
2. "G-SPEED Studio Software Utility Overview"
3. "Managing System"
4. "Managing the RAID Controller"
5. "Managing Background Activities"
6. "Managing Physical Drives"
7. "Managing Disk Arrays"
8. "Managing Logical Drives"
9. "Managing Spare Drives"

The G-SPEED Studio Software Utility requires a Thunderbolt connection between your computer and your G-SPEED Studio XL. See **Connect G-SPEED Studio XL to Your Mac®**.

The G-SPEED Studio Software Utility must be installed onto your computer before you can use it. See **Installing G-SPEED Studio Software Utility**.

Accessing the G-SPEED Studio Software Utility

Accessing the G-SPEED Studio Software Utility includes:

- Opening and closing G-SPEED Studio Software Utility
- Unlocking the UI

Opening

To open the G-SPEED Studio Software Utility, double-click the G-SPEED Studio Software Utility icon in the Applications folder. The G-Technology Utility window will open and display the Dashboard. See **G-SPEED Studio Software Utility Overview**.

You can also choose to place an alias into the dock.

Closing

There are two ways to close the G-SPEED Studio Software Utility:

G-SPEED Studio Utility icon

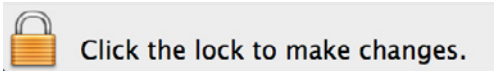
12. Click the G-SPEED Studio Software Utility drop-down menu and choose Quit G-SPEED Studio Software Utility.
13. Press Command+Q

Unlocking the UI

By default, the user interface (UI) is locked to prevent unauthorized changes to your RAID system. When the UI is locked, you cannot create logical drives or change settings on your G-SPEED Studio XL.

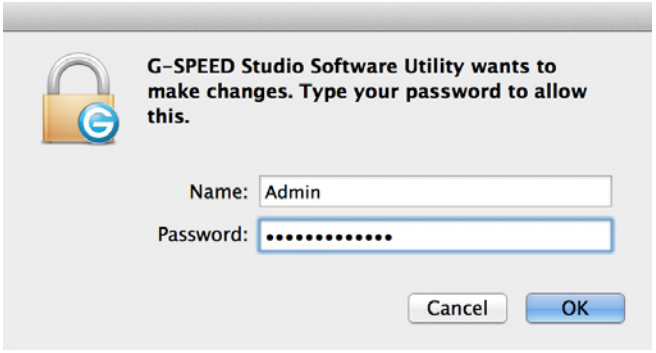
To unlock the UI:

1. At the lower-left of the G-SPEED Studio Software Utility window, click the closed lock icon.

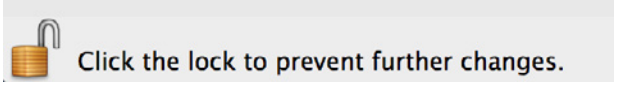


The G-SPEED Studio Software Utility password dialog box will open.

Type your computer password into the Password field, then click the OK button.



The lock icon will change to open.

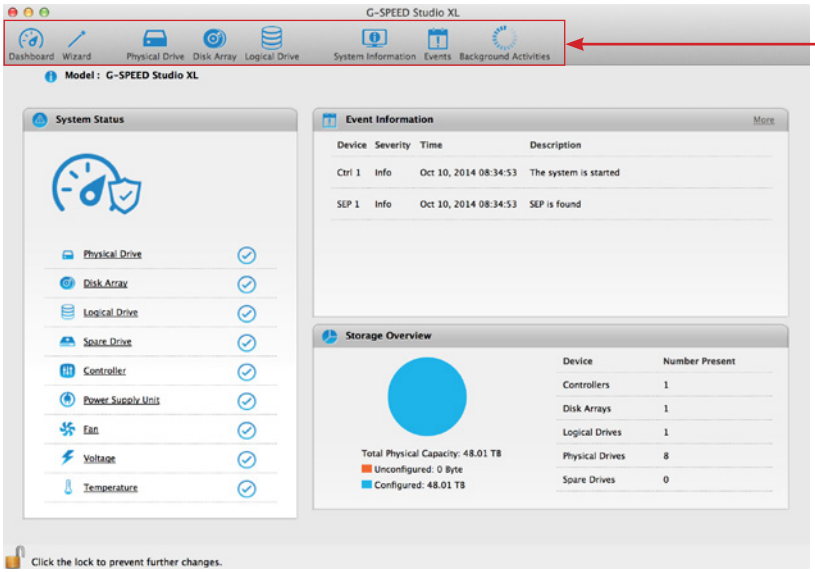


You can now add and delete logical drives, make setting changes, run background activities and update your G-SPEED Studio XL.

G-SPEED Studio Software Utility Overview

The G-SPEED Studio Software Utility interface consists of menus and icons, each leading you to a specific function.

The G-SPEED Studio Software Utility interface with the Dashboard displayed:



- **G-SPEED Studio Software Utility** – About, Checking for Updates, Preferences, Services, Hide, Quit
- **View** – Show/Hide Toolbar, Customize Toolbar, Devices (G-SPEED Studio XL units
- **Dashboard** – Show the Dashboard
- **Storage** – Wizard, Disk Array List, Logical Drive List, Spare Drive List
- **Admin** – System Information, Events, background Activities, System Updates, Performance Monitor and Restore Factory Defaults
- **Window** – Minimize, Zoom, Close Window, Bring All to Front, G-SPEED Studio XL unit
- **Help** – Links to Online help and the Support Site

Most of the functions accessed in the menu bar are described in this chapter.

Toolbar Icons

- **Dashboard** – Displays the Dashboard and overview
- **Wizard** – Displays the Wizard options for quickly setting up RAID arrays
- **Physical Drive** – Displays the physical drive list, settings and functions
- **Disk Array** – Displays menu for monitoring, managing and creating disk arrays
- **Logical Drive** – Displays the logical drive list, settings and functions
- **System Information** – Displays G-SPEED Studio XL information and settings
- **Events** – Displays the Event logs
- **Background Activity** – Display or run background tasks

The above Icons are the default icons. You can add additional icons such as Top View, Back View and Component List.

Customizing the Toolbar

You can customize the toolbar by adding or removing icons. To add remove toolbar icons:

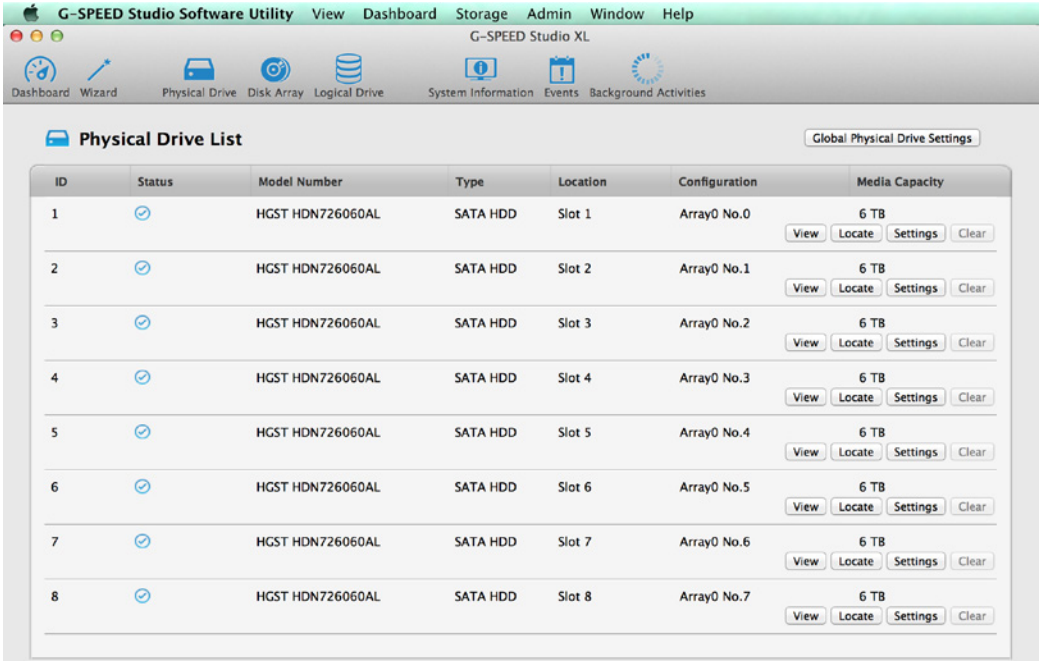
1. From the G-SPEED Studio Software Utility window, click the View menu and choose Customize Toolbar. The toolbar options dialog box will appear.
2. Do one or both actions as needed:
   - Click and drag an icon from the dialog box to the toolbar to add the icon.
   - Click and drag an icon from the toolbar to delete the icon.
3. When finished, click the Done button.

Component List

Click the Dashboard icon. From the System Status list choose Controller to view the Component List option to display the device ID, operational status, enclosure type and status description of all enclosures. The Enclosure, Controller, Buzzer and Fan menus are described in relevant sections of this chapter. See **Viewing Controller Information**, **Viewing the Enclosure Information** and **Changing Buzzer Settings** for more information.

Physical Drive Menu

Click on the Physical Drive icon in the toolbar to display the Physical Drive menu. This is the same menu obtained by clicking the Physical Drive menu button at the top of the G-SPEED Studio Software Utility window or by clicking the Physical Drive menu link under System Status in the Dashboard. See **Managing Physical Drives** for more information.


G-SPEED Studio Software Utility View Dashboard Storage Admin Window Help
G-SPEED Studio XL
Dashboard Wizard Physical Drive Disk Array Logical Drive System Information Events Background Activities
Physical Drive List
Global Physical Drive Settings
ID Status Model Number Type Location Configuration Media Capacity
1 HGST HDN726060AL SATA HDD Slot 1 Array0 No.0 6 TB View Locate Settings Clear
2 HGST HDN726060AL SATA HDD Slot 2 Array0 No.1 6 TB View Locate Settings Clear
3 HGST HDN726060AL SATA HDD Slot 3 Array0 No.2 6 TB View Locate Settings Clear
4 HGST HDN726060AL SATA HDD Slot 4 Array0 No.3 6 TB View Locate Settings Clear
5 HGST HDN726060AL SATA HDD Slot 5 Array0 No.4 6 TB View Locate Settings Clear
6 HGST HDN726060AL SATA HDD Slot 6 Array0 No.5 6 TB View Locate Settings Clear
7 HGST HDN726060AL SATA HDD Slot 7 Array0 No.6 6 TB View Locate Settings Clear
8 HGST HDN726060AL SATA HDD Slot 8 Array0 No.7 6 TB View Locate Settings Clear

Highlight Arrays

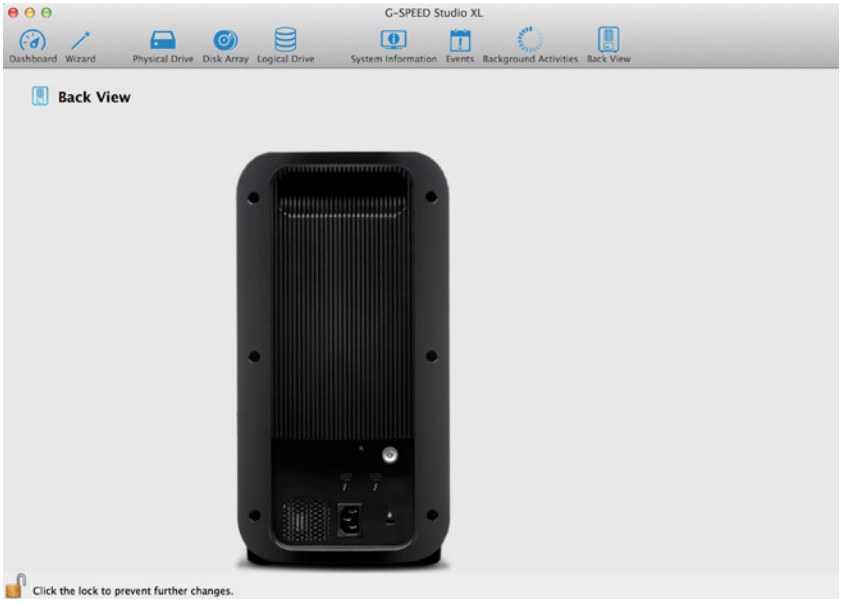
From the Disk Array menu, select the **Locate** button to identify the physical drives assigned to a disk array. The LEDs on the enclosure will appear purple and flash in sync.

The bays/carriers containing drives that do not belong to the chosen disk array will not be highlighted.

Back View

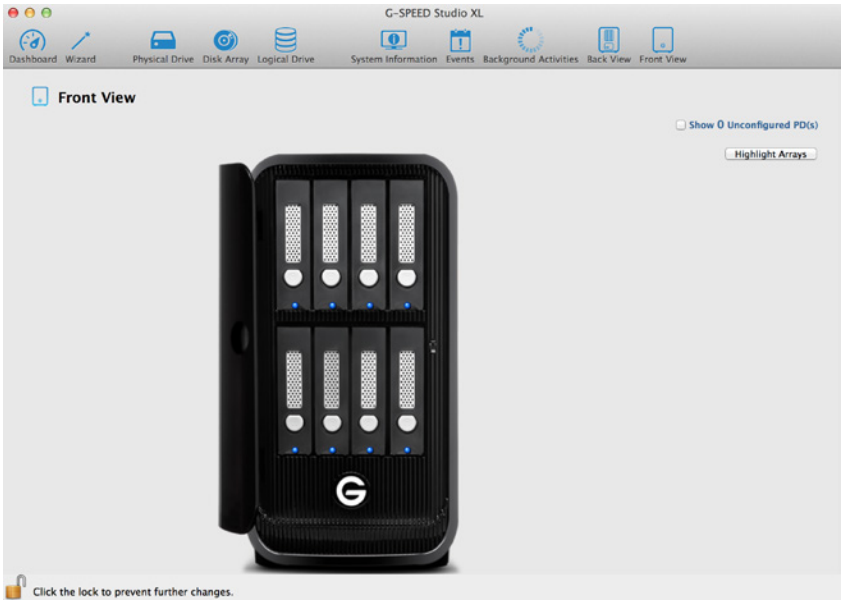
Add Back View to the Toolbar by going to the View pulldown menu and selecting Customize Toolbar. Click and Drag "Back View" to the toolbar and press Done. Then press Back View to see a virtual view of the back of your G-SPEED Studio XL. Move the cursor over the power supply unit (PSU) or system fan to display component status information.

Device: Back View display menu



Double-click on the unit to activate the blue drive lights.

Device: Front View display menu



Click on the drive modules to view the status and identify the assigned disk array.

Managing System Information

Enclosure management includes:

- "Viewing System Information"
- "Making System Settings"
- "Clearing Statistics"
- "Restoring Factory Default Settings"
- "Saving a Service Report"
- "Updating Firmware"

Viewing System Information

To view enclosure information, click the System Information icon. System Information includes:

- Alias * – (same as controller alias)
- Model
- WWN (Worldwide Number)
- Vendor
- Serial number
- Revision number
- System date and time
- Firmware version

*Adjustable under "Making System Settings" below.

Making System Settings

To make enclosure settings:

1. Click the System Information icon.
2. Click the Settings button.
3. Make changes as required. Enter an alias or change the existing alias in the field provided.
4. Click the Save button.

Clearing Statistics

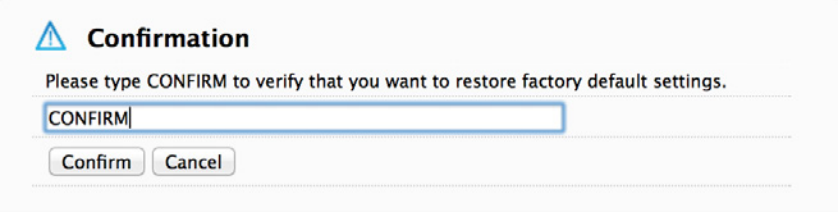
To clear statistical data on the RAID controller, physical drives, and logical drives:

1. Click the System Information icon.
2. Click the Clear Statistics button.
3. Type the word "CONFIRM" in the field provided.
4. Click the Confirm button.

Restoring Factory Default Settings

To restore all settings to their factory default values:
From the Admin drop-down menu in the menu bar at the top of your desktop, choose *Restore Factory Default*.

1. In the Restore Factory Default settings screen, check the boxes beside the settings you want to reset to default value.
   - Background activity settings
   - Controller settings
   - Physical drive settings
   - System Settings
2. Click the **Submit** button.
3. In the Confirmation box, type the word "**CONFIRM**" in the field provided and click the **Confirm** button.



Saving a Service Report

A service report can be useful to technical support for troubleshooting or diagnosing device issues. To save a service report to your Mac®, click on the **System Information** menu link, then click on the **Save Service Report** button. A prompt will ask where you want to save the HTML file containing the service report. Choose a location, then click the **Save** button. A technical support representative might ask you to email this file for system analysis.

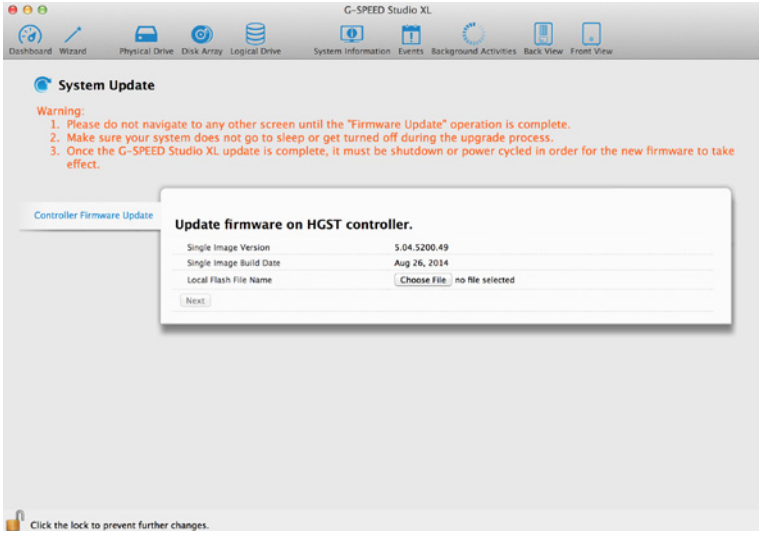
Updating Firmware

For optimal controller and system hardware performance, it is a good idea to keep your G-SPEED Studio XL firmware up to date. Download the latest firmware from the G-Technology website at www.g-technology.com/support/g-speed_studio_xl and place the .img file on your Mac®.

Note that after the update process completes, you will need to restart your Mac® for the changes to take effect.

To update the controller firmware:

1. From the Admin drop-down menu in the menu bar at the top of your desktop, choose System Update.


G-SPEED Studio XL
Dashboard
Wizard
Physical Drive
Disk Array
Logical Drive
System Information
Events
Background Activities
Back View
Front View
System Update
Warning:
1. Please do not navigate to any other screen until the "Firmware Update" operation is complete.
2. Make sure your system does not go to sleep or get turned off during the upgrade process.
3. Once the G-SPEED Studio XL update is complete, it must be shutdown or power cycled in order for the new firmware to take effect.
Controller Firmware Update
Update firmware on HGST controller.
Single Image Version
5.04.5200.49
Single Image Build Date
Aug 26, 2014
Local Flash File Name
Choose File
no file selected
Next
Click the lock to prevent further changes.

2. Click on the padlock icon to unlock the menu, then type in the password for your Mac® when the prompt appears.
3. Click the Choose File button and locate the .img file you downloaded from G-Technology.
4. Click the Submit button.
5. In the Confirmation box, type the word "CONFIRM" in the field provided and click the Confirm button.
6. The process will take several seconds. When complete, you will be prompted to restart your Mac®. Restart your Mac® and continue using your G-SPEED Studio XL.

Managing Enclosures

Enclosure management includes the following functions:

- "Viewing System Information"
- "Viewing Temperature Sensor Information"
- "Locating an Enclosure"

Viewing the Enclosure Information

Enclosure management includes the following functions:

- Click the **Dashboard** icon, then click the Controller link.
- Close the **Controller/View** page that automatically loads by clicking the X icon at the top right.
- Mouse-over the Enclosure, then click the View button.

Enclosure information includes:

- Enclosure ID
- Enclosure Warning Temperature Threshold
- Controller Warning Temperature Threshold
- SEP Firmware Version
- Max Number of Controllers
- Max Number of Fans
- Max Number of Power Supply Units
- Enclosure Type
- Enclosure Critical Temperature Threshold
- Controller Critical Temperature Threshold
- Max Number of Physical Drive Slots
- Max Number of Temperature Sensors
- Max Number of Voltage Sensors

Click the **X** icon to close the information panel.

Viewing Temperature Sensor Information

To view the status of the temperature sensor:

1. Click the Dashboard icon, then click the Temperature link.
2. Scroll down until you see Temperature Sensors.
   Temperature Sensors information includes:
   - ID
   - Status (Normal, Warning or Critical icon)
   - Location (Controller or Backplane)
   - Healthy Threshold (Enclosure Warning Temperature Threshold)
   - Current Temperature

Click the **X** icon to close the information panel.

Locating an Enclosure

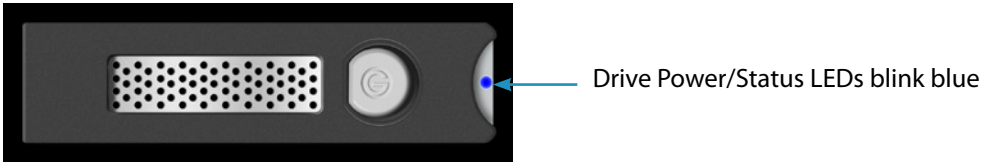
If you have multiple G-SPEED Studio XL units and you want to verify which unit you are accessing in the G-Technology Utility, use the Locate function.

To locate an enclosure:

1. From **Logical Drive** Icon Click the **Locate** button.

The Drive Power /Status LEDs on all drive carriers blink blue for one minute.

Running the Locate function to identify an enclosure:



Managing the RAID Controller

RAID controller management includes:

- "Viewing Controller Information"
- "Viewing Controller Statistics"
- "Changing Controller Settings"
- "Changing Buzzer Settings"

Viewing Controller Information

To view controller information, you can access the Controller info page from the Dashboard panel under System Status. You can also select the Component List from the **View** pull-down window and navigate to Customize Toolbar where you can add **Component List**. The Information tab will be displayed.

Controller information includes:

Controller ID
Vendor
Operational Status
Cache Usage – Percentage
Part Number
Hardware Revision
SCSI Protocol Supported
Single Image Version
Host Driver Version
Alias * (same as enclosure alias)
Model
Power On Time
Dirty Cache Usage – Percentage
Serial Number
WWN (Worldwide Number)
BIOS Version
Single Image Build Date

To view advanced information, click the **Advanced Information** tab.

Advanced controller information includes:

Memory Type19. Flash Type
NVRAM Type
Preferred Cache Line Size
Coercion *
SMART *
Write-Back Cache Flush Interval *
Enclosure Polling Interval *
Forced Read Ahead (Cache) *
Memory Size
Flash Size
NVRAM Size
Cache Line Size
Coercion Method *
SMART Polling Interval *
Through Mode *
Adaptive Write-Back Cache

*Adjustable under **"Changing Controller Settings"**

Click the **X** icon to close the information panel.

Viewing Controller Statistics

To view controller statistics:

1. Click the **Dashboard** icon, then click the **Controller** link.
2. Click the **Statistics** tab.

Controller statistics include:

Data Transferred
Write Data Transferred
Non-Read/Write Errors
Write Errors
Non-Read/Write Requests
Write I/O Requests
Statistics Collection Date and Time
Read Data Transferred
Errors
Read Errors
I/O Requests
Read I/O Requests
Statistics Start Date and Time

3. Click the X icon to close the information panel.

Changing Controller Settings

To change controller settings:

1. From the Dashboard, select **Controller.**
2. Mouse-over the controller, then click the **Settings** button.

You may make any of the following settings changes:

- Enter, change or delete the alias in the **Alias** field.

SMART Log – Check the box to enable or uncheck to disable.
SMART Polling Interval – Enter a value into the field from 1 to 1440 minutes. (1440 minutes = 24 hours) (SMART Log must be enabled to access this function).
Enable Coercion – Check the box to enable or uncheck to disable.
Coercion Method – Choose a method from the drop-down menu:

- GBTruncate
- 10GBTruncate
- GrpRounding
- TableRounding

Write Back Cache Flush Interval – Enter a value into the field from 1 to 12 seconds.
Enclosure Polling Interval – 15 to 255 seconds.

- Adaptive Writeback Cache – Check the box to enable or uncheck to disable.
- Forced Read Ahead – Check the box to enable or uncheck to disable.
- Pilot LED Brightness – High, Medium, Low, Off
- Enable HDD Park Ahead(Level 1)
- HDD Park Ahead Interval (10-1440)
- Enable HDD Low Rotation Speed (Level 2)
- HDD Low Rotation Speed Interaval (10-1440)
- Enable HDD Idle Spin Down(Level 3)
- HDD Idle Spin Down Interval (10-1440)

3. Click the **Save** button.
4. Click the **X** icon to close the settings panel.

Changing Buzzer Settings

To change buzzer settings:

1. From the **Dashboard** icon, select **Controller**.
2. Mouse-over the buzzer, then click the **Settings** button.
3. Check the **Enable Buzzer** box to enable the buzzer or uncheck the box to disable.
4. Click the **Save** button.

Managing Background Activities

Background activity management includes:

- "Viewing Current Background Activities"
- "Adding a Scheduled Background Activity"
- "Changing a Background Activity Schedule"
- "Enabling or Disabling a Scheduled Background Activity"
- "Deleting a Scheduled Background Activity"
- "Media Patrol"
- "Redundancy Check"
- "Initialization"
- "Rebuild"
- "Migration"
- "PDM"

Background activities perform a variety of preventive functions on your physical drives, disk arrays, logical drives and other components.

You can run a background activity immediately or schedule it to run at a later time. Scheduling options are described below.

Setting options for each activity are listed after the scheduling options. These settings determine how the background activity affects I/O performance

Viewing Current Background Activities

To view a list of background activities, click on the **Background Activities** icon in the Toolbar.
The following list of background activities will appear:

- Media Patrol
- Redundancy Check
- Rebuild
- Migration
- PDM
- Initialization
- Transition
- Synchronization

Currently running activities show a progress bar.

Viewing Scheduled Background Activities

To view a list of scheduled background activities:

1. Click on the **Background Activities** icon.
2. Click the **Scheduler** button. The list of scheduled background activities will appear.

Adding a Scheduled Background Activity

To add a new scheduled background activity:

1. Click on the **Background Activities** icon.
2. Click the **Scheduler** button. The list of scheduled background activities will appear.
3. Click the **Add Schedule** button.
4. Make schedule settings as desired.

Choose the option for the activity you want:

- Media Patrol
- Redundancy Check
- Spare Check

Choose a **Start Time** from the drop-down menus.

The menus have a 24-hour clock.
Choose a **Recurrence Pattern** option: daily, weekly or monthly.

- For the Daily option, enter an interval in the *Every* field.
- For the Weekly option, enter an interval in the Every field and choose one or more days of the week.
- For the Monthly option, choose the Day of the Month option or a sequential and specific day from the drop-down menu. Also choose which months should apply.

Choose a **Start From** date from the drop-down menus.

Choose an **End On** option:

- No end date or perpetual
- End after a specific number of activity actions
- Run until date from the drop-down menus

For Redundancy Check, choose:

- **Auto Fix** option – Attempts to repair the problem when it finds an error. Check to enable.
- **Pause on Error** option – The process stops when it finds a non-repairable error. Check to enable.
- **Select LD** – Check the boxes for which logical drives should run the redundancy check. Check at least one logical drive.

Click the **Save** button.

To return to currently running background activities, click the **Background Activities** button.

Changing Background Activity Schedule

To change an existing scheduled background activity:

1. Click on the **Background Activities** icon.
2. Click the **Scheduler** button. The list of scheduled background activities will appear.
3. Mouse-over the background activity, then click the **Settings** button.
4. Make settings as needed.

Choose the option for the activity you want:

- Media Patrol
- Redundancy Check
- Spare Check

Choose a **Start Time** from the drop-down menus.

The menus have a 24-hour clock.
Choose a **Recurrence Pattern** option: daily, weekly or monthly.

- For the Daily option, enter an interval in the Every field.
- For the Weekly option, enter an interval in the Every field and choose one or more days of the week.
- For the Monthly option, choose a Day of the Month option or a sequential and specific day from the drop-down menu. Also choose which months should apply.

Choose a **Start From** date from the drop-down menus.
Choose an **End On** option:

- No end date or perpetual
- End after a specific number of activity actions
- Run until a specified date from the drop-down menus

For Redundancy Check, choose:

- Auto Fix option – Attempts to repair the problem when it finds an error. Check to enable.
- Pause on Error option – The process stops when it finds a non-repairable error. Check to enable.
- Select LD – Check the boxes for which logical drives should run the redundancy check. Check at least one logical drive.

Click the **Save** button.

To return to currently running background activities, click the **Background Activities** button.

Enabling or Disabling a Scheduled Background Activity

Background activity schedules are enabled by default when you create a schedule. If you want to stop a background activity now but plan to use it again in the future, disable the scheduled activity rather than deleting it.

To enable or disable changes in an existing scheduled background activity:

1. Click on the **Background Activities** icon.
2. Click the **Scheduler** button. The list of scheduled background activities will appear.
3. Mouse-over the background activity, then click the **Settings** button.
4. Uncheck the Enable This Schedule box to disable this particular schedule. Check the box to enable it.
5. Click the **Save** button.

To return to currently running background activities, click the **Background Activities** button.

Deleting a Scheduled Background Activity

To delete a scheduled background activity:

1. Click on the **Background Activities** icon
2. Click the **Scheduler** button. The list of scheduled background activities will appear.
3. Type the word "CONFIRM" in the field provided.
4. Click the **Confirm** button.

To return to currently running background activities, click the **Background Activities** button.

Media Patrol

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks are enabled by default on all disk arrays and spare drives. Media Patrol is concerned with the media itself, not the data recorded on the media. If Media Patrol encounters a critical error, it triggers Predictive Data Migration (PDM) if PDM is enabled on the disk array. See M**aking Disk Array Settings**.

Changing Media Patrol Settings

To change Media Patrol settings:

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. Check the Enable Media Patrol box to enable the feature; uncheck the box to disable it. This setting enables or disables Media Patrol for all physical drives.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

Redundancy Check

Redundancy Check is a routine maintenance procedure for fault-tolerant disk arrays (those with redundancy) that ensures the redundant copies of data still match the original source data. Redundancy Check can also correct inconsistencies.

See **Redundancy Check on a Logical Drive**

Changing Redundancy Check Settings

To change Redundancy Check settings:

1. Click on the Background Activities icon.
2. Click the Settings button.
3. Click the Redundancy Check Rate drop-down menu and choose a rate:
   - **Low**: Fewer system resources are required for redundancy checking, leaving more resources for data read/write operations.
   - **Medium:** Balances system resources between redundancy checking and data read/write operations.
   - **High:** Allocates more system resources to Redundancy Check and fewer to data read/write operations.
4. Click the Confirm button.
5. Click the X icon to close the background activities panel.

Initialization

Initialization is normally done to logical drives after they are created from a disk array. Initialization sets all data bits in the logical drive to zero. This action is useful because there may be residual (possibly sensitive) data on logical drives left from earlier configurations. For this reason, initialization is recommended whenever you create a logical drive.

Note: You cannot access a logical drive while it is initializing.

See **Initializing a Logical Drive**.

Changing Initialization Settings

To change initialization settings:

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. **Click the Logical Drive Initialization Rate drop-down menu and choose a rate:**
   - **Low**: Fewer system resources are allocated to initialization, leaving more resources for data read/write operations.
   - **Medium:** Balances system resources between initialization and data read/write operations.
   - **High:** More system resources are allocated to initialization, fewer to data read/write operations.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

Rebuild

When you rebuild a disk array, you are actually using redundant data to rebuild the lost or inaccessible data on one physical drive.

- When a physical drive in a disk array fails and a spare drive of adequate capacity is available, the disk array begins to rebuild automatically using the spare drive.
- If there is no spare drive of adequate capacity, but the **Auto Rebuild** function is ENABLED, the disk array will begin to rebuild automatically as soon as you remove the failed physical drive and install an unconfigured physical drive in the same slot. See **Making Rebuild Settings**.
- If there is no spare drive of adequate capacity and the Auto Rebuild function is DISABLED, you must replace the failed drive with an unconfigured physical drive, then perform a **Manual Rebuild**.

See **Rebuilding a Disk Array** and **Managing Spare Drives**. Also see **Disk Array Degraded** / **Logical Drive Critical** and **Disk Array Offline** / **Logical Drive Offline**.

Changing Rebuild Settings

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. Click the **Rebuild Rate** drop-down menu and choose a rate:
   - **Low**: Fewer system resources are allocated to the rebuild, leaving more resources for data read/write operations.
   - **Medium:** Balances system resources between the rebuild and data read/write operations.
   - **High:** More system resources are allocated to the rebuild and fewer for data read/write operations.
4. Check the **Enable Auto Rebuild** box to enable Auto Rebuild. This will initiate a rebuild when you swap out the failed drive with a new one.
5. Click the **Confirm** button.
6. Click the **X** icon to close the background activities panel.

Migration

The term "Migration" means that you are doing one or both of the following:

- **Changing the RAID level of a logical drive**
- **Expanding the storage capacity of a logical drive (See Migrating a Logical Drive)**

Changing Migration Settings

To change migration settings:

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. Click the **Migration Rate** drop-down menu and choose a rate:
   - **Low**: Fewer system resources are available for migration, leaving more resources for data read/write operations.
   - **Medium:** Balances system resources between migration and data read/write operations.
   - **High:** More system resources are available for migration, fewer for data read/write operations.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

PDM

Predictive Data Migration (PDM) is the migration of data from the suspect disk drive to a spare drive. PDM is similar to rebuilding a disk array, but unlike in rebuilding, PDM automatically copies your data to a spare drive before the drive fails and your logical drive goes "critical."

PDM can be triggered automatically by Media Patrol.

Also see **Running PDM on a Logical Drive**.

Changing PDM Settings

To change PDM settings:

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. Click the **PDM Rate** drop-down menu and choose a rate:
   - **Low**: Fewer system resources are allocated to PDM, leaving more resources for data read/write operations.
   - **Medium:** Balances system resources between PDM and data read/write operations.
   - **High:** More system resources are available to PDM, fewer for data read/write operations.
   - Highlight the current values in the block threshold fields and input new values. The reassigned block threshold range is 1 to 512 blocks. Error block threshold range is 1 to 2048 blocks.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

Transition

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare drive.

See **Running a Transition on a Spare Drive**.

Changing Transition Settings

To change Transition settings:

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. Click the **Transition Rate** drop-down menu and choose a rate:
   - **Low**: Fewer system resources are available to Transition, leaving more resources for data read/write operations.
   - **Medium:** Balances system resources between Transition and data read/write operations.
   - **High:** More system resources are available for Transition and fewer for data read/write operations.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

Synchronization

Synchronization is automatically applied to logical drives when they are created. Synchronization recalculates redundancy data to ensure that the working data on the physical drives is properly in sync.

Mouse-over on the logical drive, click the **View** button, and look under Logical Drive Information beside the line that says **Synchronized**. A **Yes** means that the logical drive was synchronized.

See **Viewing Logical Drive Information**.

Changing Synchronization Settings

To change Synchronization settings:

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. Click the **Background Synchronization Rate** drop-down menu and choose a rate:
   - **Low**: Fewer system resources are available to Synchronization, leaving more resources for data read/write operations.
   - **Medium:** Balances system resources between Synchronization and data read/write operations.
   - **High:** More system resources are available to Synchronization and fewer for data read/write operations.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

Managing Physical Drives

Physical drive management includes:

- "Viewing a List of Physical Drives"
- "Viewing Physical Drive Information"
- "Viewing Physical Drive Statistics"
- "Viewing Physical Drive SMART Log Information"
- "Locating a Physical Drive"
- "Making Global Physical Drive Settings"
- "Making Individual Physical Drive Settings"
- "Making Physical Drive SMART Log Settings"
- "Clearing a Stale or a PFA Condition"
- "Forcing a Physical Drive Offline"

Viewing a List of Physical Drives

To view a list of physical drives in your G-SPEED Studio XL, click the Physical Drive icon.

Physical drive information includes:

- **ID** – ID number of the physical drive
- **Status -** Normal, Stale, or PFA or Dead icon
- **Model Number**
- **Type** – SATA HDD or SSD
- **Location** – Enclosure number and slot number
- **Configuration** – Array number and sequence number, spare number, unconfigured or stale configuration
- **Media Capacity** – In terabytes

Viewing Physical Drive Information

To view physical drive information:

1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want, then click the **View** button. Physical drive information includes:
   - **Physical Drive ID – ID number of the physical drive**
   - **Location – Enclosure number and slot number**
   - **Alias – If assigned**
   - **Physical Capacity – Total capacity in TB**
   - **Configurable Capacity – Usable capacity in TB**
   - **Used Capacity – Capacity actually used in TB**
   - **Block Size – Typically 512 Bytes**
   - **Operational Status – OK (normal), Stale, PFA, Dead**
   - **Configuration Status – Array number and sequence number, spare number**
   - **Model Number – Make and model of the drive**

- **Drive Interface** – SATA 1.5, 3 Gb/s or 6 Gb/s
- **Serial Number** – Serial number of the drive
- **Firmware Version** – Firmware version on the drive
- **Protocol Version** – ATA/ATAPI protocol version

3. Click the Advanced Information tab. Advanced information for physical drives includes:
   - **Write Cache** – Enabled or disabled*
   - **Read Look Ahead Cache** – Enabled or disabled*
   - **SMART Feature Set** – Yes or No
   - **SMART Self Test** – Yes or No
   - **MART Error Logging** – Yes or No
   - **Command Queuing Support** – TCQ or NCQ
   - **Command Queuing** – Enabled or disabled*
   - **Queue Depth** – Number of commands
   - **Power Saving Level** – Supported by this drive
   - **Medium Error Threshold****
   - **Drive Temperature**
   - **Drive Reference Temperature**

*Adjustable under **Viewing Physical Drive Statistics**.
Adjustable under **Changing PDM Settings.

4. Click the **X** icon to close the information panel.

Viewing Physical Drive Statistics

To view physical drive statistics:

1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want, then click the **View** button.
3. Click the **Statistics** tab.

Physical drive information includes:

- Data Transferred
- Read Data Transferred
- Write Data Transferred
- Errors – Number of errors
- Non Read/Write Errors
- Read Errors
- Write Errors
- I/O Request – Number of requests
- Non-Read/Write Request – Number of requests
- Read I/O Request – Number of requests
- Write I/O Request – Number of requests
- Statistics Start Time – Time and date
- Statistics Collection Time – Time and date

To clear physical drive statistics, see **Clearing Statistics**.

4. Click the **X** icon to close the settings panel.

Viewing Physical Drive SMART Log Information

To view physical drive SMART Log information:

1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want, then click the **View** button.
3. Click the **SMART Log** tab.

SMART Log information includes:

- Physical Drive ID
- SMART Support – Yes or No, depending on the drive
- SMART Status – Enabled or disabled*
- SMART Health Status – OK is normal

*Adjustable under **Changing Controller Settings**.

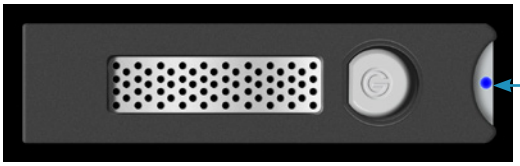
4. Click the **X** icon to close the settings panel.

Locating a Physical Drive

This feature causes the drive carrier LEDs to blink for one minute to help you locate the physical drive. To locate a physical drive:

1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want, then click the **Locate** button. The drive power/status LED for the drive carrier holding that drive will blink blue for one minute.

Running the Locate function to identify a physical drive:



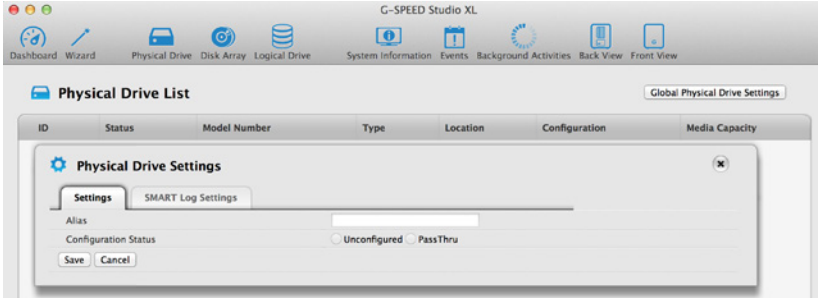
Drive power/status LEDs blink blue and orange

Changing Global Physical Drive Settings

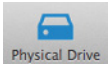
To change global physical drive settings:

1. Click the **Physical Drive** icon
2. Click the **Global Physical Drive Settings** button
3. Check the following boxes to enable functionality; uncheck them to disable.
   - Enable Write Cache
   - Enable Read Look Ahead Cache
   - Enable Command Queuing
4. Click the **Save** button.
5. Click the **X** icon to close the settings panel.

Changing Individual Physical Drive Settings



To change individual physical drive settings:



1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want, then click the **Settings** button.
3. Make changes as needed:
   - Enter, change or delete the alias in the Alias field.
   - Choose Unconfigured or PassThru Configuration.
   - Unconfigured drives are not visible to your computer. You will use these to make disk arrays. PassThru drives are visible to your computer and are configured as individual drives. They cannot be used to make a disk array.
4. Click the **Save** button.
5. Click the **X** icon to close the settings panel.

Changing Physical Drive SMART Log Settings

To change physical drive SMART log settings:

1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want, then click the **Settings** button.
3. Click the SMART Log Settings tab.
4. Check the box to enable the SMART log.
5. Click the **Save** button.
6. Click the **X** icon to close the settings panel.

Clearing a Stale or PFA Condition

Stale – The physical drive contains obsolete disk array information.
PFA – The physical drive has errors resulting in a prediction of failure.

Be sure you have first corrected the condition by replacing the physical drive and conducting a rebuild operation, etc. Then clear the PFA condition.

To clear a Stale or a PFA condition:

1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want, then click the **Clear** button.

Click the the **Confirm** button.

If the physical drive has both a Stale condition and a PFA condition, your first click will remove the Stale condition. Click the **Clear** button a second time to remove the PFA condition.

Running Media Patrol on Your Physical Drives

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks are enabled by default on all disk arrays and spare drives. Media Patrol is concerned with the media itself, not the data recorded on the media. If Media Patrol encounters a critical error, it triggers Predictive Data Migration (PDM) if PDM is enabled on the disk array. See **Making Disk Array Settings**.

To run Media Patrol on your physical drives:

1. Click the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Media Patrol, then click the **Start** button.

To pause or resume a Media Patrol:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Media Patrol, then click the **Pause** or **Resume** button.

To stop/cancel the Media Patrol:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Media Patrol, then click the **Stop** button.
3. In the Confirmation box, type the word "confirm" in the field provided, then click the **Confirm** button.

Managing Disk Arrays

Disk array management includes:

- "Viewing a List of Disk Arrays"
- "Viewing Disk Array Information"
- "Creating a Disk Array Manually"
- "Creating a Disk Array and Logical Drive With the Wizard"
- "Making Disk Array Settings"
- "Locating a Disk Array"
- "Deleting a Disk Array"
- "Preparing a Disk Array for Transport"
- "Rebuilding a Disk Array"

Also see **Disk Array and Logical Drive Problems**.

Viewing a List of Disk Arrays

To view a list of disk arrays, do one of the following actions:

1. From the Dashboard window, click the **Disk Array** link.
2. The list of disk arrays will appear.
   Each disk array lists:
   1. **ID** – DA0, DA1, etc.
   2. **Alias** – If assigned
   3. **Status** - Normal, Degraded or Incomplete/Physical Drive missing icon)
   4. **Capacity** – Data capacity of the array
   5. **Free Capacity** – Unconfigured or unused capacity on the physical drives
   6. **Media Patrol** – Enabled or disabled on this array
   7. **Number of Logical Drives** – The number of logical drives on this array

Viewing Disk Array Information

To view disk array information:

1. Do one of the following actions:
   - From the Dashboard window, click the **Disk Array** link.
   - From the Storage menu, choose **Disk Array**.
2. Mouse-over the disk array you want, then click the **View** button.

Disk array information includes:

- **Disk Array ID** – DA0, DA1, etc.
- **Alias** – If assigned
- **Operational Status** – OK, Degraded or Offline
- **Media Patrol** – Enabled or disabled in this array
- **PDM** – Enabled or disabled in this array
- **Total Physical Capacity** – Maximum capacity, including used and unused capacity, of the physical drives
- **Configurable Capacity** – Data capacity of the array
- **Free Capacity** – Unconfigured or unused capacity on the physical drives
- **Max. Contiguous Free Capacity** – The largest single chunk of unused capacity on the physical drives
- **Number of Physical Drives** – The number of physical drives in this array
- **Number of Logical Drives** – The number of logical drives in this array
- **Number of Dedicated Spares** – The number of spare drives dedicated to this array
- **Available RAID Levels** – RAID levels that this disk array can support

Creating a Disk Array Manually

This feature only creates a disk array. You can also use the Wizard to create a disk array with logical and spare drives concurrently.

To create a disk array:

1. From the Dashboard menu, click the **Disk Array** link.
2. Click the **Create Disk Array** button.
3. Accept the defaults or make changes:
   - Enter an alias in the **Alias** field with a maximum of 32 characters (letters, numbers and spaces between characters).
   - **Enable Media Patrol** – Uncheck to disable on this array. For more information, see **Media Patrol**.
   - **Enable PDM** – Uncheck to disable on this array. For more information, see **PDM**.
4. In the **Select Physical Drives** diagram, click drives to add them to your array. The drive carriers turn blue when you click them. The physical drives' ID numbers will appear in the field below the diagram.
5. When you have finished your settings and choices, click the **Submit** button.

The new array will appear in the list.

- If you are done creating disk arrays, click the **Finish** button.
- To create additional disk arrays, click the **Create More** button.

After you create a disk array, create a logical drive on it. See **Creating a Logical Drive Manually.**

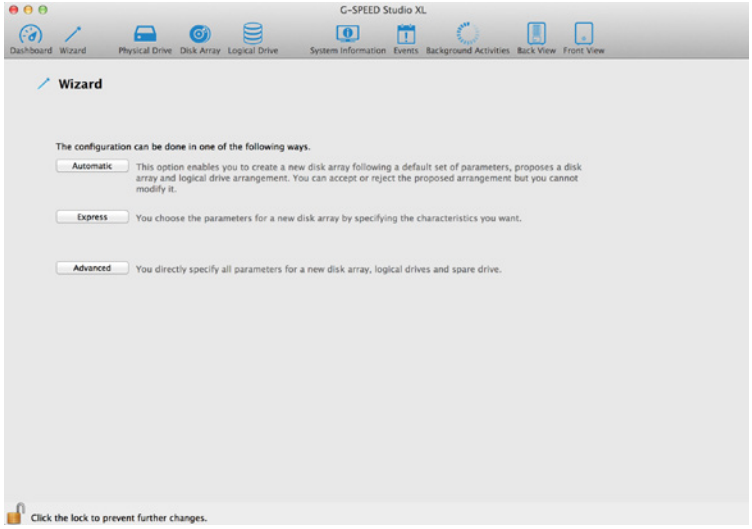
Creating a Disk Array and Logical Drive With the Wizard

A disk array is a method of organizing data across hard disks or solid state drives. One or more logical drives can be created on a disk array. Your computer saves files within logical drives on G-SPEED Studio XL.

The G-Technology Utility includes a Wizard to help you set up a disk array, logical drives and spare drives. To open the Wizard, click the Storage menu and choose **Wizard**.

The Wizard dialog box will open and offer three configuration methods.

Wizard dialog box:


G-SPEED Studio XL
Dashboard
Wizard
Physical Drive
Disk Array
Logical Drive
System Information
Events
Background Activities
Back View
Front View
Wizard
The configuration can be done in one of the following ways.
Automatic
This option enables you to create a new disk array following a default set of parameters, proposes a disk array and logical drive arrangement. You can accept or reject the proposed arrangement but you cannot modify it.
Express
You choose the parameters for a new disk array by specifying the characteristics you want.
Advanced
You directly specify all parameters for a new disk array, logical drives and spare drive.
Click the lock to prevent further changes.

Choose the best method for your needs as per the following table:

Method	User options	Suggested for users who are
Automatic	None	New to data storage
Express	General parameters	Familiar with data storage
Advanced	Individual parameters	Data storage professionals

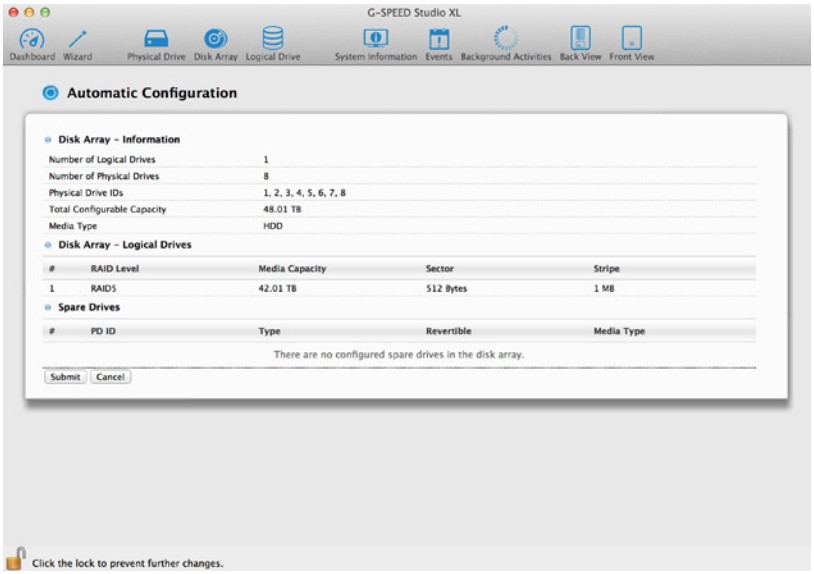
Choosing Automatic Configuration

To use the Automatic Configuration Wizard:

1. From the Storage menu, choose **Wizard**.
2. Click the **Automatic** button.

The Automatic Configuration dialog box will appear.

Automatic Configuration dialog box:



3. Do one of the following actions:
   - If you agree with the proposed configuration, click the Submit button. The Wizard will create your disk array and logical drive. The Wizard can also create a spare drive.
   - If you do NOT agree with the proposed configuration, click the **Cancel** button to return to the original Automatic Configuration menu.

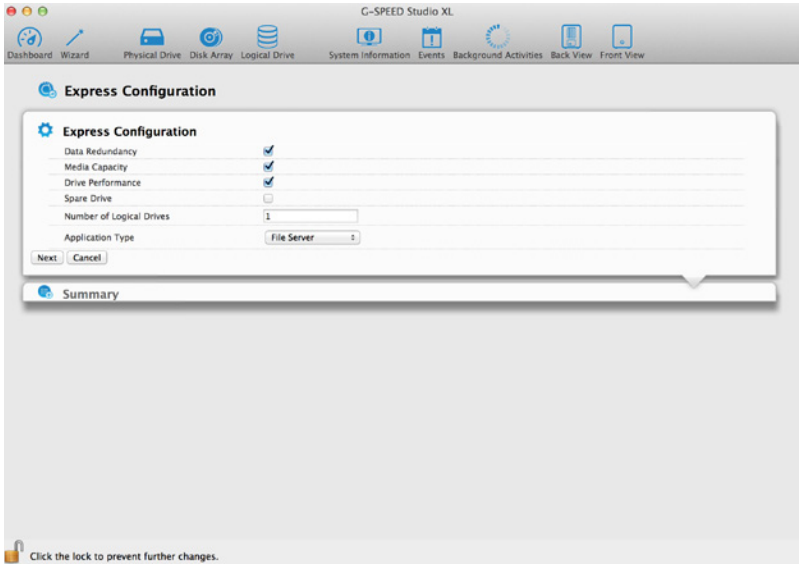
Choosing Express Configuration

To use the Express Configuration Wizard:

1. From the Storage menu, choose **Wizard**.
2. Click the **Express** button.

The Express Configuration dialog box will appear.

Express Configuration dialog box:

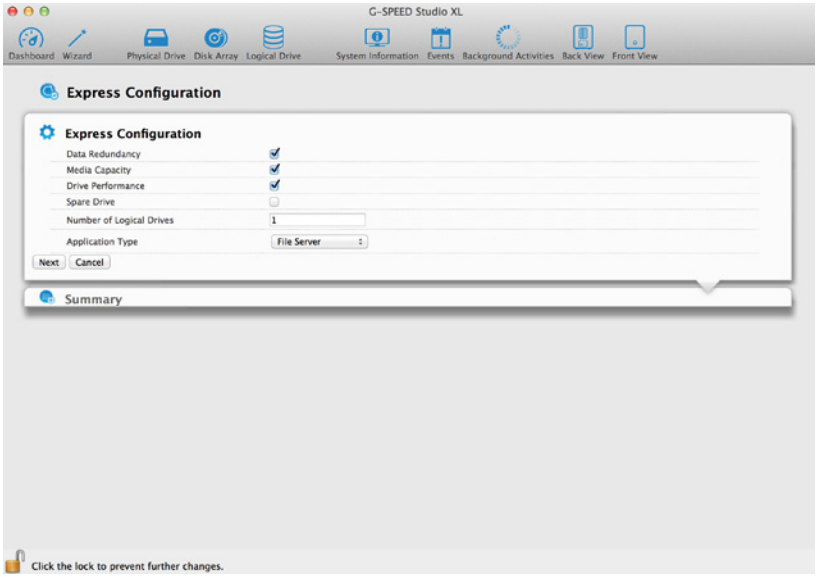


3. Check the boxes to choose any one or a combination of:
   - **Data Redundancy** – The array remains available if a physical drive fails
   - **Media Capacity** – The greatest possible amount of data capacity
   - **Drive Performance** – The highest possible read/write speed
   - **Spare Drive** – Check box to create a hot spare drive (R6 and R8 only)
   - **Number of Logical Drives** – Enter a number of logical drives to create
   - **Application Type** – Choose how the storage will be used
4. In the Number of Logical Drives field, type the number of logical drives you want to make from this disk array.

5. From the **Application Type** drop-down menu, choose an application that best describes your intended use for the logical drives.
    - File Server (default)
    - Video Stream
    - Transaction Data
    - Transaction Log
    - Other
6. Click the **Next** button to continue.

The Summary dialog box will appear with information about the disk arrays, logical drives and spare drives you are about to create. See example below.

The Summary dialog box:



7. Perform one of the following actions:
    - If you accept these parameters, click the **Submit** button.
      The Wizard will create your disk array and logical drives. If you have an R6 or R8, the Wizard will also create a spare drive.
    - If you do NOT accept these parameters, click the **Back** button, then review and modify your choices.
    - Press **Cancel** to dismiss the configuration all together.

Choosing Advanced Configuration

This option enables you to specify additional parameters for a new disk array, logical drives and spare drives.

To use the Advanced Configuration Wizard:
1. From the Storage menu, choose **Wizard**.
2. Click the **Advanced** button.

The Create Disk Array screen will display.

Task 1 – Disk Array Creation

To create your disk array:
1. Accept the defaults or make changes to any of the following:
    - Enter an alias in the Alias field, up to a maximum of 32 characters (letters, numbers and spaces between characters).
    - **Media Patrol** – Uncheck to disable on this array. For more information, see **Media Patrol**.
    - **PDM** – Uncheck to disable on this array. For more information, see **PDM**.
2. In the Select Physical Drives diagram, click the desired drives to add them to your array. Drive carriers turn blue when you click them. The physical drives' ID numbers appear in the field below the diagram.
3. Click the **Next** button to continue.

The Create Logical Drive screen will display.

Task 2 – Logical Drive Creation

To create your logical drive:
1. Enter your information and choose your options.
    - Enter a logical drive alias in the field provided.
    - Choose a RAID level from the drop-down menu. Note the max capacity value, then enter a capacity value in the field provided and choose a unit of measure from the drop-down menu.

- Enter a value for capacity and choose the appropriate size unit of measurement (MB, GB or TB)
- Choose a Stripe size: 64 KB, 128 KB, 256 KB, 512 KB and 1 MB are available.
- Choose a Sector size: 512 B, 1 KB, 2 KB, and 4 KB are available.
- Choose a Read Cache Policy: The choices are Read Cache, Read Ahead (cache), and None.
- Choose a Write (cache) Policy: The choices are WriteThru and WriteBack. WriteBack requires a ReadCache or Read Ahead/Read Cache Policy.
- If you want the Utility to format your logical drives, leave the Format box checked.

For additional format options, see **Formatting Your Logical Drives**.

2. Click the **Add** button. The new logical drive will appear on the list at the right. If any capacity remains, you will have the option to create an additional logical drive.
3. Click the **Next** button to continue. The **Create Spare Drive** screen will display.

Task 3 – Spare Drive Creation

To create your spare drive:

1. For each of the following items, accept the default or change the following settings as required:
   - Check the **Revertible box** if you want a revertible spare drive. A revertible spare drive returns to its spare drive assignment after you replace the failed physical drive in the disk array and run the Transition function.
   - **Global** – Allows the spare to be used by any disk array
   - **Dedicated** – Restricts the drive to only working with the disk array you are now creating
2. In the **Select Physical Drives** diagram, click a drive to choose it for your spare. The drive carrier will turn blue when you click it. The physical drive's ID number will appear in the field below the diagram.
3. Click the **Next** button to continue. The **Summary** screen will display.

Task 4 – Summary

1. Review your choices of disk array, logical drives and spare drive.
    - To make any changes, click the **Back** button to reach the appropriate screen.
    - To accept, click the **Submit** button. Creating the disk array, logical drive and spare drive will take a few moments.
2. Click the **Finish** button to close the Wizard.

Formatting Your Logical Drives

If you left the Format box checked under *Task 2 – Logical Drive Creation*, your logical drives will be formatted automatically.

If you unchecked the Format box, you must format your logical drives manually.

When the G-Technology Utility finishes the partition and format operation, new removable drive icons, each representing one logical drive, will appear on your desktop. When you see these icons, your new logical drive(s) will be ready to use.

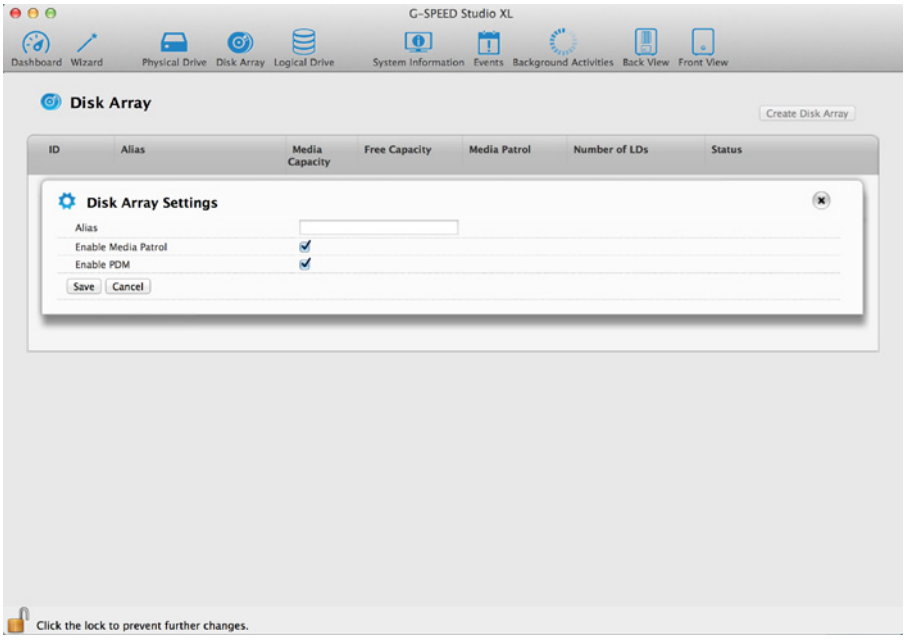
Changing Disk Array Settings

To make disk array settings:

1. Do one of the following actions:
    - From the Dashboard window, click the **Disk Array** link.
    - From the Storage menu, choose **Disk Array**.
2. Mouse-over the disk array you want, then click the **Settings** button.

3. Make the following setting changes as required:
    - Enter change, or delete the alias in the Alias field. An alias must be a maximum of 32 characters (letters, numbers and spaces between characters).
    - **Enable Media Patrol** – Check to enable or uncheck to disable on this array.
    - **Enable PDM** – Check to enable or uncheck to disable on this array.
4. Click the **Save** button.

Locating a Disk Array

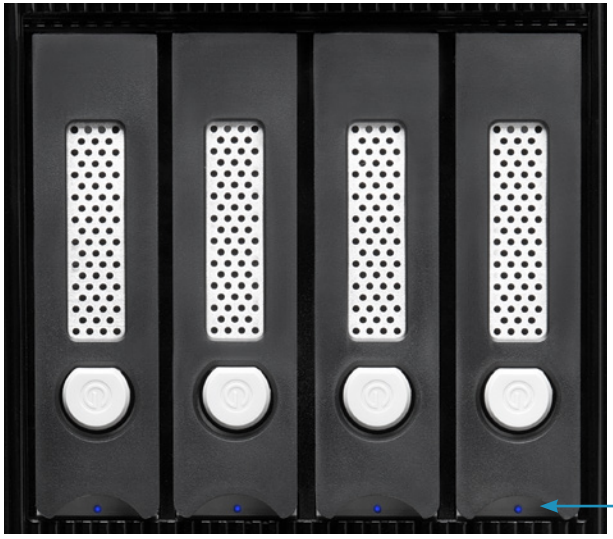


This feature causes the drive carrier LEDs to flash for one minute to assist you in locating the physical drives that make up a given disk array. To locate a disk array:

1. Perform one of the following actions:
    - From the Dashboard window, click the **Disk Array** link.
    - From the Storage menu, choose **Disk Array**.

2. Mouse-over the disk array you want to identify, then click the **Locate** button. The drive power/status LEDs for the physical drives that comprise the array will blink blue for one minute.

Running the Locate function to identify a disk array:



Deleting a Disk Array

Delete Logical Drive 0
WARNING: ALL DATA on the logical drive will be LOST!
Please type CONFIRM to verify that you want to delete this logical drive.
Confirm
Cancel

To delete a disk array:

1. Perform one of the following actions:
   - From the Dashboard window, click the **Disk Array** link.
   - From the Storage menu, choose Disk Array.
2. Mouse-over the disk array you want, then click the Delete button.
3. In the Confirmation box, type the word "CONFIRM" in the field provided, then click the **Confirm** button.

Preparing a Disk Array for Transport

This feature prepares the physical drives that make up the disk array to be removed from the enclosure and installed in a different G-SPEED Studio XL enclosure. To prepare a disk array for transport:

1. Perform one of the following actions:
   - From the Dashboard window, click the **Disk Array** link.
   - From the Storage menu, choose **Disk Array**.
2. Mouse-over the disk array you want, then click the **Transport** button.
3. In the Confirmation box, type the word "CONFIRM" in the field provided, then click the **Confirm** button. The disk array status will change to Transport Ready.
4. Remove the physical drives and install them in their new location.

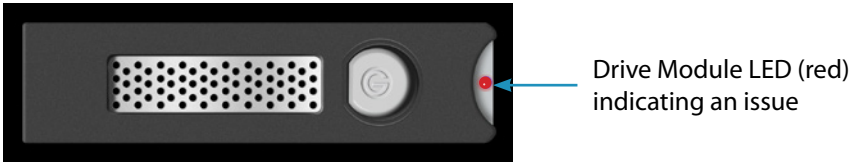
See **Replacing a Physical Drive** for more information.

Rebuilding a Disk Array

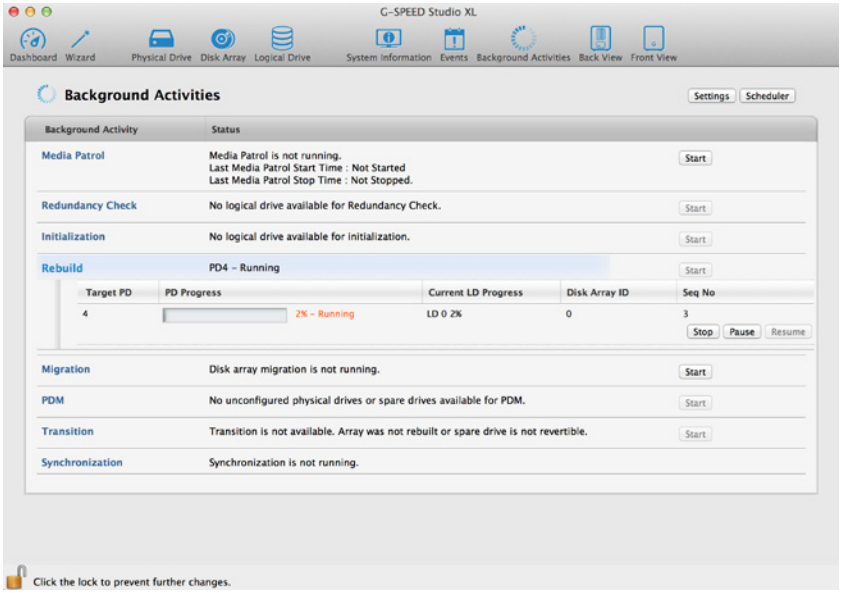
When you rebuild a disk array, you actually rebuild data on one physical drive from redundant data maintained on other drives. If there is no spare drive of adequate capacity, you must replace the failed drive with an unconfigured physical drive, then perform a **Manual Rebuild**.

On the carrier with the failed drive, the drive power/ status LED will be red.

Drive carrier LEDs for a dead or failed drive:



Performing a Manual Rebuild



To perform a manual rebuild:

1. Click on the **Background Activities** icon.
2. Mouse-over **Rebuild**, then click the **Start** button.
3. From the **Source Physical Drive** drop-down menu, choose a **Source** disk array and physical drive. Arrays have an ID number. Physical drives have a sequence number.
4. From the **Target Physical Drive** drop-down menu, choose a **Target** physical drive.
5. In the Confirmation box, type the word "CONFIRM" in the field provided, then click the **Confirm** button. While the disk array is rebuilding:
   - The disk array will show a green check icon and a **Rebuilding** status.
   - Logical drives under the disk array will continue to show a yellow "!" icon and a **Critical**, **Rebuilding** status.
   - If the buzzer is enabled, your G-SPEED Studio XL unit will emit two quick beeps every five seconds. When the beeps stop, the rebuild will be done.

Pausing and Resuming a Rebuild

To pause or resume a Rebuild:

1. Click on the **Background Activities** icon.
2. Mouse-over **Rebuild**, then click the **Pause** or **Resume** button.

Stopping a Rebuild

To stop or cancel a Rebuild:

1. Click on the **Background Activities** icon.
2. Mouse-over **Rebuild**, then click the **Stop** button.
3. Click the **Confirm** button. Also see **Making Rebuild Settings**.

Managing Logical Drives

Logical drive management includes:

- "Viewing a List of Logical Drives"
- "Viewing Logical Drive Information"
- "Viewing Logical Drive Statistics"
- "Making Logical Drive Settings"
- "Viewing Logical Drive Check Tables"
- "Creating a Logical Drive Manually"
- "Formatting Your Logical Drives"
- "Locating a Logical Drive"
- "Deleting a Logical Drive"
- "Initializing a Logical Drive"
- "Redundancy Check on a Logical Drive"
- "Migrating a Logical Drive"
- "Running PDM on a Logical Drive"

Viewing a List of Logical Drives

To view a list of logical drives, perform one of the following actions:

- Click the **Logical Drive** icon.
- From the Storage menu, choose **Logical Drive**.

The list of logical drives will appear. Logical drive information includes:

- **ID** – LD0, LD1, etc.
- **Alias** – If assigned
- **Status** - Normal, Critical or Offline icon
- **Capacity** – Data capacity of the logical drive
- **RAID Level** – Set when the logical drive was created
- **Stripe** – Set when the logical drive was created
- **Cache Policy** – Read and write cache settings
- **Array ID** – ID number of the disk array where this logical drive was created

Viewing Logical Drive Information

To view logical drive information:

1. Do one of the following actions:
   - Click the **Logical Drive** icon.
   - From the Storage menu, choose **Logical Drive**. The list of logical drives will appear.
2. Mouse-over the logical drive you want, then click the **View** button.

Logical Drive information will display, including:

- **Logical Drive ID** – LD0, LD1, etc.
- **Alias** – If assigned
- **Array ID** – ID number of the disk array where this logical drive was created
- **RAID Level** – Set when the logical drive was created
- **Operational Status** – OK, Critical or Offline

- **Capacity** – Data capacity of the logical drive
- **Number of Axles** – For RAID 10, two axles
- **Physical Capacity** – Data capacity of the physical drives
- **Number of Physical Drives** – The number of physical drives in the disk array
- **Stripe size** – Set at logical drive creation
- **Read Policy** – ReadCache, ReadAhead or None *
- **Sector size** – Set at logical drive creation
- **Write Policy** – WriteThru or WriteBack *
- **Current Write Policy** – May change from WriteBack to WriteThru under certain conditions
- **Preferred Controller ID** – Not applicable
- **Tolerable Number of Dead Drives Per Axle** – Number of physical drives that can fail without the logical drive going offline
- **Synchronized** – A new logical drive shows "No" until synchronizing is completed. See **Synchronization**
- **Parity Pace** – Pertains to some RAID levels
- **WWN** – Worldwide Number, a unique identifier assigned to this logical drive
- **RAID 5 and 6 Algorithm** – Pertains to RAID 5 and 6
- **Codec Scheme** – Pertains to some RAID levels
- **Serial No.** – Serial number assigned to this logical drive

Viewing Logical Drive Statistics

To view logical drive statistics:

1. Do one of the following actions:
   - Click the **Logical Drive** icon.
   - From the Storage menu, choose **Logical Drive**. The list of logical drives will appear.

2. Mouse-over the logical drive you want, then click the **View** button.
3. Click the **Statistics** tab. Logical Drive statistics will display, including:
    - Data Transferred – In megabytes
    - Read Data Transferred – In megabytes
    - Write Data Transferred – In megabytes
    - Errors
    - Non-Read/Write Errors
    - Read Errors
    - Write Errors
    - I/O Requests
    - Non-Read/Write I/O Requests
    - Read I/O Requests
    - Write I/O Requests
    - Statistics Start Time
    - Statistics Collection Time
4. Click the **X** icon to close the statistics panel.

To clear the check tables, see **Clearing Statistics**.

Changing Logical Drive Settings

To change logical drive settings:

1. Do one of the following actions:
    - Click the **Logical Drive** icon.
    - From the Storage menu, choose **Logical Drive**. The list of logical drives will appear.
2. Mouse-over the logical drive you want, then click the **Settings** button.
3. Make setting changes as required:
    - Enter, change or delete the alias in the Alias field. Aliases must have a maximum of 32 characters (letters, numbers and spaces between characters).
    - Choose a Read (cache) Policy. Read Cache, Read Ahead and No Cache are available.
    - Choose a Write (cache) Policy. Write Back and Write Through (Thru) are available.
4. Click the **Save** button.

For more information, see **Read Cache Policy** and **Write Cache Policy**.

Viewing Logical Drive Check Tables

This feature allows you to view error tables. Use this information to evaluate the integrity of a logical drive and determine whether corrective action is needed.

To view logical drive check tables:

1. Do one of the following actions:
    - Click the **Logical Drive** icon.
    - From the Storage menu, choose **Logical Drive**. The list of logical drives will appear.
2. Mouse-over the logical drive you want, then click the **Check Table** button.
3. Choose an option:
    - **All** – All errors (default)
    - **Read Check** – Read errors for this logical drive
    - **Write Check** – Write errors for this logical drive
    - **Inconsistent Block** – Inconsistent blocks for this logical drive, meaning that mirror data for RAID levels 1, 1E and 10 and/or parity data for RAID levels 5 and 6 may contain errors. Inconsistencies are identified by the Redundancy Check.

The Check Table lists:

- **Table Type** – Read Check, Write Check or Inconsistent Block
- **Start Logical Block Address** – The LBA of the first block for this entry
- **Count** – The number of errors or continuous blocks starting from this LBA

4. Click the **X** icon to close the information panel.

To clear the check tables, see **Clearing Statistics**.

Creating a Logical Drive Manually

This feature creates a logical drive only. You can also use the Wizard to create a disk array with logical drives and spare drives concurrently. See **Creating a Disk Array and Logical Drive With the Wizard**. To create a logical drive manually:

1. One of the following actions:
    - Click the **Logical Drive** icon.
    - From the Storage menu, choose **Logical Drive**.
2. Click the **Create Logical Drive** button.
3. Click the radio button of the disk array you want to use, then click the **Next** button.
4. Accept the defaults or make changes from the following:
    - Optional. Enter an alias in the **Alias** field with a maximum of 32 characters (letters, numbers and spaces).
    - Choose a **RAID level**. The choice of RAID levels will depend in part on the number of physical drives in the disk array.
    - In the Capacity field, accept the default maximum capacity or enter a lesser capacity in MB, GB or TB. Any remaining capacity will be available for an additional logical drive.
    - Choose a Stripe size: 64KB, 128KB, 256KB, 512KB and 1MB are available.
    - Choose a Sector size: 512KB, 1KB, 2KB and 4KB are available.
    - Choose a Read (cache) Policy: Read Cache, Read Ahead and No Cache are available.
    - Choose a Write (cache) Policy: Write Back and Write Through (Thru) are available. The Write Cache is always set to WriteThru when the Read Cache is set to NoCache.
    - If you want the G-SPEED Studio Software Utility to format your logical drives, leave the **Format** box checked. See **Formatting Logical Drives**.
5. Click the **Add** button. The new logical drive will appear on the list at the right. If any capacity remains, you can create an additional logical drive. G-SPEED Studio XL supports up to 32 logical drives.
6. When finished, click the **Submit** button. The new logical drive(s) will appear in the logical drive list. The new Volume will appear on the desktop.

Formatting Your Logical Drives

If you left the **Format** box checked when you created your logical drives, they will be formatted automatically.

If you Unchecked the Format box, you must format your logical drives manually. See **Formatting Logical Drives**.

When the G-SPEED Studio Software Utility finishes formatting, new drive icons, each representing one logical drive, will appear on your desktop (right).

When you see the icon, your logical drive will be ready to use.

Locating a Logical Drive

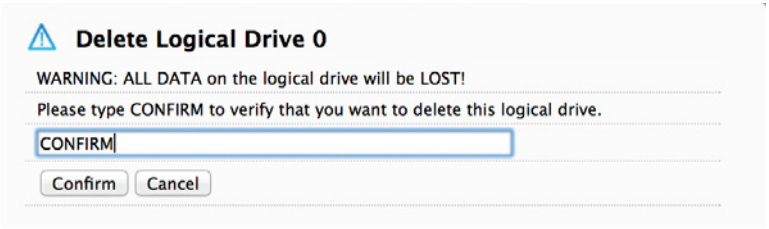
This feature causes the drive carrier LEDs to flash for one minute to assist you in locating the physical drives that make up a logical drive.

To locate a logical drive:

1. Click the **Logical Drive** icon. The list of logical drives will appear.
2. Mouse-over the logical drive you want, then click the **Locate** button. The drive power/status LEDs for the physical drives that make up the logical drive will blink blue for one minute.

Running the Locate function to identify a disk array:

Deleting a Logical Drive

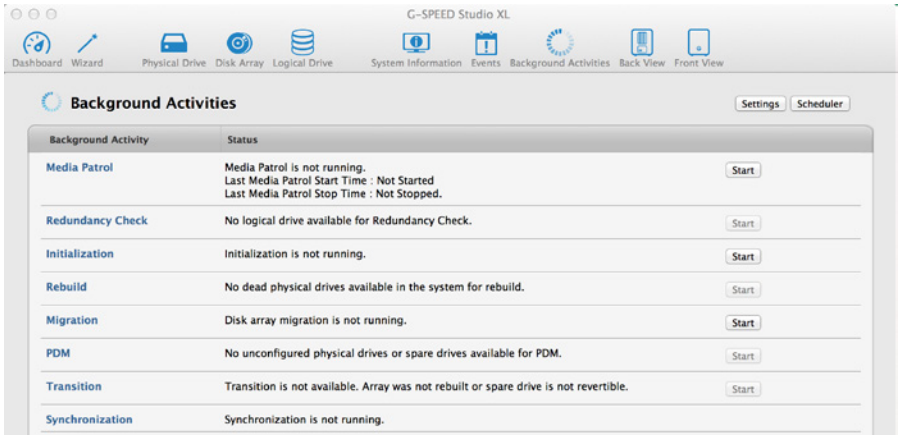

Delete Logical Drive 0
WARNING: ALL DATA on the logical drive will be LOST!
Please type CONFIRM to verify that you want to delete this logical drive.
CONFIRM
Confirm
Cancel

This action requires administrator or superuser privileges. To delete a logical drive:

1. Perform one of the following actions:
   - Click the **Logical Drive** icon.
   - From the Storage menu, choose **Logical Drive**. The list of logical drives will appear.
2. Mouse-over the disk array you want, then click the **Delete** button.
3. In the Confirmation box, type the word "CONFIRM" in the field provided, then click the **Confirm** button.

Initializing a Logical Drive

Initialization is normally done to logical drives after they are created from a disk array.



To initialize a logical drive:
1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Initialization, then click the **Start** button.
3. Check the box to the left of the logical drive you want to initialize.
4. Choose the initialization option you want:
    - **Quick Initialization** – Check this box and then enter a value in the Quick Initialization Size field.
    - **Full Initialization** – Enter a hexadecimal value in the Initialization Pattern in the Hex field or use the default 00000000 value.
5. Click the **Confirm** button.
6. In the Confirmation box, type the word "CONFIRM" in the field provided, then click the **Confirm** button.

Pausing and Resuming an Initialization

To pause or resume Initialization:
1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Initialization, then click the **Pause** or **Resume** button.

Stopping an Initialization

To stop/cancel the Initialization:
1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Initialization, then click the **Stop** button.
3. In the Confirmation box, type the word "CONFIRM" in the field provided, then click the **Confirm** button.

Redundancy Check on a Logical Drive

Redundancy Check is a routine maintenance procedure for fault-tolerant disk arrays (those with redundancy) that ensures the redundant copies of data still match the original source data. Redundancy Check can also correct inconsistencies.

To run Redundancy Check on a logical drive:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Redundancy Check, then click the **Start** button.
3. Check the boxes to the left of the logical drives on which to run Redundancy Check.
4. Check the option you want:
    - **Auto Fix** – Attempts to repair the problem when it finds an error
    - **Pause on Error** – The process stops when it finds a non-repairable error
5. Click the **Confirm** button.

Pausing and Resuming a Redundancy Check

To pause or resume a Redundancy Check:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Redundancy Check, then click the **Pause** or **Resume** button.

Stopping a Redundancy Check

To stop or cancel the Redundancy Check:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Redundancy Check, then click the **Stop** button. Click the **Confirm** button.

Migrating a Logical Drive

Migration means one or both of the following:

- Changing the RAID level of a logical drive
- Expanding the storage capacity of a logical drive

Before you begin a migration, examine your current disk array to determine whether:

- The physical drives in your array can support the target RAID level
- There is sufficient capacity to accommodate the target logical drive size

If you need to add physical drives to your array, be sure there are unassigned physical drives installed in your RAID system before you begin migration. See **RAID Levels** and **RAID Level Migration**.

To migrate a logical drive:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Migrate, then click the **Start** button.
3. In the **Select Disk Array** drop-down menu, choose the source disk array.
4. In the **Select Physical Drives** diagram, click the drives you wish to add to your array. The ID numbers of the chosen drives will appear in the field below the diagram.
5. Click the **Next** button.
6. Check the box next to the logical drive you want to modify.
7. From the drop-down menu, choose a **target RAID level**. The choice of RAID levels will depend in part on the number of physical drives in the disk array. See the note below.
8. In the **Capacity** field, either accept the current capacity or check the **Expand Capacity** box and enter a greater capacity in MB, GB or TB. If any capacity remains, you can create an additional logical drive.
9. Click the **Next** button. The logical drive ID numbers, with their original and target RAID levels and capacities, are shown.
10. To accept the proposed target values, click the **Confirm** button.

Running PDM on a Logical Drive

Predictive Data Migration (PDM) is the migration of data from the suspect disk drive to a spare drive, similar to rebuilding a disk array. But unlike rebuilding, PDM automatically copies your data to a spare drive *before* the drive fails and your logical drive goes critical.

PDM can be triggered automatically by Media Patrol. See **PDM**. To run PDM on a logical drive:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over PDM, then click the **Start** button.
3. Choose a Source Physical Drive. The Source Physical Drive is the drive suspected of possible failure. Source Physical Drives are identified by their disk array and sequence numbers in the disk array.
4. Choose a Target Physical Drive. The Target Physical Drive is the replacement drive. Target Physical Drives are identified by their physical drive ID number.
5. Click the **Confirm** button.

Pausing and Resuming PDM

To pause or resume PDM:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over PDM, then click the **Pause** or **Resume** button.

Stopping PDM

To stop or cancel PDM:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over PDM, then click the **Stop** button.
3. Click the **Confirm** button.

Managing Spare Drives

Spare drive management includes:

- Viewing a List of Spare Drives (see below)
- "Creating a Spare Drive Manually"
- "Making Spare Drive Settings"
- "Running Spare Check"
- "Deleting a Spare Drive"
- "Running a Transition"

Viewing a List of Spare Drives

To view a list of spare drives, perform the following action:

- From the Dashboard window, click **Spare Drive**.

Spare Drive information will display, including:

- **ID** – Spare0, Spare1, etc.
- **Status** - Normal, Rebuilding, or Failed/Missing icon
- **Configurable Capacity** – Usable capacity of the spare drive
- **Physical Drive ID** – ID number of the physical drive chosen for this spare
- **Revertible** – Yes or No
- **Spare Type** – Global or Dedicated
- **Dedicated to Array** – ID number of the disk array to which the spare is dedicated

Viewing Spare Drive Information

To view spare drive information:

1. Perform the following action:
   - From the Dashboard window, click **Spare Drive**.
2. Mouse-over the spare drive you want, then click the **View** button.

Spare Drive information will display, including:

- **Spare Drive ID** – Spare0, Spare1, etc.
- **Physical Drive ID** – ID number of the physical drive chosen for this spare
- **Location** – Enclosure number and slot number
- **Model Number** – Make and model of the physical drive
- **Operational Status** – OK, Rebuilding, Failed or Missing
- **Spare Type** – Global or Dedicated *
- **Physical Capacity** – Total data capacity of the spare drive
- **Revertible** – Yes or No*
- **Configurable Capacity** – Usable capacity of the spare drive
- **Spare Check Status** – Not Checked or Healthy
- **Media Patrol** – Enabled or Not Enabled*
- **Dedicated to Array** – ID number of the disk array to which the spare is dedicated*

*Adjustable under **Making Spare Drive Settings**. For Spare Check, see **Running Spare Check**.

3. Click the **X** icon to close the information panel.

Creating a Spare Drive Manually

This feature creates a spare drive only. You can also use the Wizard to create a disk array with logical drives and spare drives concurrently. See **Spare Drives** for more information.

To create a spare drive:

1. Perform the following action:
   - From the Dashboard window, click the **Spare Drive** link.
2. Click the **Create Spare Drive** button.

3. For each of the following items, accept the default or change the settings as required:
    - Check the **Revertible** box if you want a revertible spare drive. A revertible spare drive returns to its spare drive assignment after you replace the failed physical drive in the disk array and run the Transition function.
    - Type (choose spare type)
        - **Global** – Can be used by any disk array
        - **Dedicated** to the specific disk array noted by the checked radio button.
    - **Media Type:** If you have more than one type of physical drive installed (SSD and HDD, for example), choose the type of drive for the spare.
4. In the **Create Spare Drive** diagram, click a drive to choose as your spare. The drive carrier will turn blue when you click this. The physical drive's ID number will appear in the field below the diagram.
5. Click the **Submit** button to continue. If you are done creating spare drives, click the **Finish** button. To create another spare drive, click the **Create More** button.

Changing Spare Drive Settings

For more information on settings options, see **Spare Drives**. To change spare drive settings:

1. From the Dashboard window, click the **Spare Drive** link. The list of spare drives will appear.
2. Mouse-over the spare drive you want, then click the **Settings** button.
3. Accept the default or change the settings as required:
    - In the **Revertible** drop-down menu, choose Yes or No.
    - In the **Spare Type** drop-down menu, choose **Global** or **Dedicated**.
    - If you use chose a Dedicated spare, check the box beside the disk array to which this spare drive is assigned.
4. Click the **Save** button.

Running Spare Check

Spare Check verifies the status of your spare drives. To run Spare Check:

1. From the Dashboard window, click the **Spare Drive** link. The list of spare drives will appear.
2. Mouse-over the spare drive you want, then click the **Spare Check** button.
3. Click the **Confirm** button.

Spare Check has no pause, resume or stop functions. When Spare Check completes, it adds "Healthy" next to Spare Check Status on the Spare Drive information box. After the "Spare Check completed" message appears, click the **View** button to see **Spare Check Status**.

Deleting a Spare Drive

This action requires administrator or superuser privileges. To delete a spare drive:

1. From the Dashboard window, click the **Spare Drive** link. The list of spare drives will appear.
2. Mouse-over the spare drive you want, then click the **Delete** button.
3. In the Confirmation box, type the word "confirm" in the field provided, then click the **Confirm** button.

Running a Transition on a Spare Drive

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. You must specify an unconfigured physical drive of the same or larger capacity and same media type as the revertible spare drive. Also see **Transition**.

Running a Transition

To run a Transition on a revertible spare drive:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Transition, then click the **Start** button.
3. Choose a Source Physical Drive. The Source Physical Drive is the revertible spare drive that is now part of the disk array. Source Physical Drives are identified by their disk array and sequence numbers within the disk array.
4. Choose a Target Physical Drive. The Target Physical Drive is the drive that replaces the revertible spare. Target Physical Drives are identified by their physical drive ID number.
5. Click the **Confirm** button.

Pausing and Resuming a Transition

To pause or resume a Transition:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Transition, then click the **Pause** or **Resume** button.

Stopping, Pausing or Resuming a Transition

To stop/cancel a Transition:

1. Click on the **Background Activities** icon. The list of background activities will appear.
2. Mouse-over Transition, then click the **Stop** button.
3. Click the **Confirm** button.

Formatting Logical Drives

A RAID logical drive must also be formatted to be compatible with your computer. In this User Manual, the term "format" includes both partition and format operations.

You can format your logical drives using the:

- G-SPEED Studio Software Utility with **Default settings**
- G-SPEED Studio Software Utility with **Custom Settings**
- Mac OS® Disk Utility

Both the G- SPEED Studio Software Utility and your Mac®'s Disk Utility offer a choice of formatting options. However, if there is no specific reason to customize the settings, G-Technology's default format settings are recommended.

G-SPEED Studio XL Software with Default Settings

Wizard, Automatic or Express

When you create your logical drives using the Wizard's *Automatic* or *Express* options, your logical drives are always formatted automatically.

When the G- SPEED Studio Software Utility finishes its format operation, new removable drive icons, each representing one logical drive, will appear on your desktop. When you see the icon, your logical drive will be ready to use.

Wizard, Advanced or Manual Creation

When you create your logical drives using the Wizard's *Advanced* option, the Format option is enabled by default.

When the G- SPEED Studio Software Utility finishes the format operation, new removable drive icons, each representing one logical drive, will appear on your desktop. When you see the icon, your logical drive is ready to use.

For more information, see **Creating a Disk Array and Logical Drive With the Wizard** and **Creating a Logical Drive Manually**.

G-SPEED Studio Software Utility with Custom Settings

To use your own format settings, you must create your logical drives using the Wizard's Advanced option or create your logical drives manually, and you must un-check the Format box.

See **Creating a Disk Array and Logical Drive With the Wizard** and **Creating a Logical Drive Manually**

To format your logical drives using the G-SPEED Studio Software Utility with your own settings:

1. In the Logical Drive list, mouse-over the logical drive you want to format, then click the **Format** button.
2. Supply information as required:
   - **Optional**: Type a different name into the Volume Name field.
   - Choose a partition from the Partition Type drop-down menu.
   - Choose a format type from the Format Type drop-down menu.

- For Macintosh® computers, the default GPT Format partition and the default.
- Journaled HFS+ format are recommended.

3. **Click** the **Format** button.

When the G-SPEED Studio Software Utility has finished the partition and format operation, new removable drive icons, each representing one logical drive, will appear on your desktop. When you see the icon, your logical drives will be ready to use.

Disk Utility

For information on using your computer's Disk Utility application, see the online help or the computer's user manual.

To format your logical drives using the computer's Disk Utility, you must create your logical drives using the Wizard's *Advanced* option or create your logical drives manually, and you must un-check the **Format** box.

See **Creating a Disk Array and Logical Drive With the Wizard** and **Creating a Logical Drive Manually**

To format your logical drives using the computer's Disk Utility:

4. Click the **Go** menu and choose **Utilities** from the drop-down list.
5. Double-click the **Disk Utility** icon to open the utility.
6. In the drive list, highlight the logical drive you want to format, then click the **Partition** button.

4. Change your Volume Scheme, Volume Information and Options settings, then click the **Apply** button.

For Macintosh® computers, the default GPT Format partition and the default *Journaled* HFS+ format are recommended.

5. In the Confirmation dialog box, click the Partition button.

When Disk Utility has finished the partition and format operation, new removable drive icons, each representing one logical drive, will appear on your desktop and your logical drives will be ready to use.

Spare Drives

A spare drive is a physical drive that you designate to automatically replace the failed physical drive in a disk array. See **Creating a Spare Drive Manually**.

G-Technology's general recommendation is to acquire at least one spare drive and configure the spare(s) as a **global revertible** spare drive(s).

Options

There are several options you can specify for a spare drive:

System Options

- **Revertible** – A revertible spare returns to its spare drive assignment after you replace the failed physical drive in the disk array and run the Transition function.
- **Media Patrol** – By default, Media Patrol runs on spare drives unless you disable it.

Spare Type

- **Global** – Can be used by any disk array
- **Dedicated** – Can be used only by the assigned disk array

Media Type (type of physical drive)

- Hard disk drive (HDD)

Requirements

The spare drive must have adequate capacity to replace the largest physical drive in your disk arrays. Additionally, it must be the same media type as the physical drives in your disk arrays. A revertible spare drive requires you to replace the failed physical drive in the disk array and run the Transition function.

Transition

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare, whereupon the revertible spare drive will return to its original status. To run the Transition function, the spare drive must be revertible.

In addition, you must specify an unconfigured physical drive of the same or larger capacity and the same media type as the revertible spare drive.

Running a Transition

The Transition feature enables you to specify "permanent" spare drives for your G-SPEED Studio XL unit. Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. The revertible spare drive will return to its original status.

Transition happens automatically when the following sequence of events takes place:

- You create a revertible spare drive. See **Creating a Spare Drive Manually**.
- A physical drive assigned to your disk array fails and the array goes Critical or Degraded.
- G-SPEED Studio XL automatically rebuilds your array to the revertible spare drive and the array becomes functional again.
- You replace the failed physical drive with a new physical drive of equal or greater capacity.
- G-SPEED Studio XL automatically transitions (moves) the data from the revertible spare to the new physical drive.
- The new physical drive becomes part of the array and the revertible spare drive returns to its original spare status.

Transition happens manually when you specify an unconfigured physical drive as a transition target for data from the revertible spare drive.

G|SPEED® STUDIO XL
with Thunderbolt™

Maintenance for Your Drive

- Replace a Failed Disk Drive ..... p. 101
- Initialize Drive for Mac® ..... p. 103
- Restore the Drive Icon ..... p. 106
- Reformat with Partitions ..... p. 108

G-Technology®

Replace a Failed Disk Drive

The G-SPEED Studio RAID Controller continually monitors the health of each disk drive in G-SPEED Studio XL. In the event of a disk failure, you will be alerted based on the notification settings you entered in Set Up Alert Notifications. G-SPEED Studio XL will report the failed drive and help you locate its physical position in the G-SPEED Studio XL enclosure.

Mute the Alarm

By default, G-SPEED Studio XL has the audible alarm enabled. If a drive fails or other critical events occur, the alarm will become audible. To mute the audible alarm, you can press the Alarm Mute button on the back of the enclosure (see image) or you can launch the G-SPEED Studio Software Utility. In the utility under the controller settings, there is a Buzzer section you can use to mute the alarm.

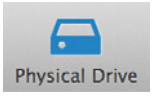
This same area can be used to test the alarm by simply clicking on **Sound**.

Note About Drive Failure

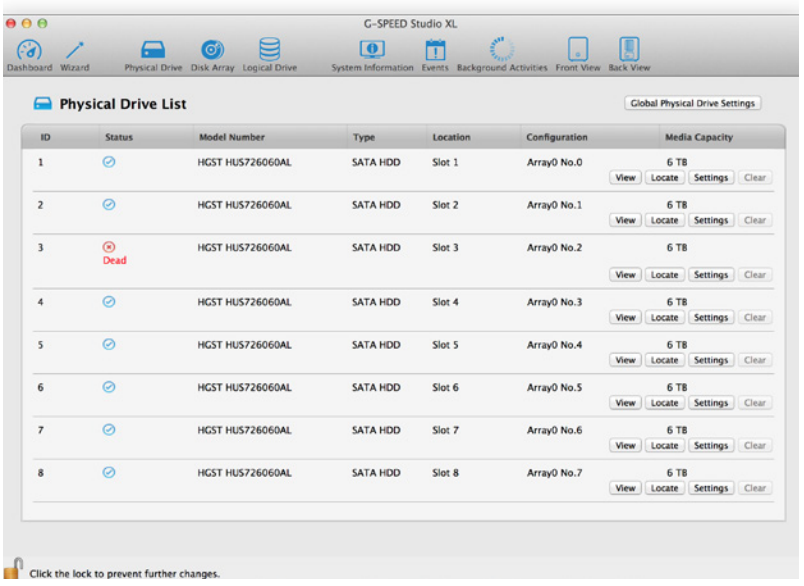
If your G-SPEED Studio XL was configured in RAID 1 or RAID 5 mode, a drive failure does not necessarily result in data loss. However, the array will now operate in a degraded and unprotected state. The failed drive should be replaced as soon as possible to avoid data loss.

Follow the steps on the next page to identify and replace a failed drive.

1. Launch the G-SPEED Studio Software Utility.
2. Select the **Physical Drive**.



3. The Physical Drive List will show all of the drives and next to its name the status will indicate **Dead**.


G-SPEED Studio XL
Dashboard
Wizard
Physical Drive
Disk Array
Logical Drive
System Information
Events
Background Activities
Front View
Back View
Physical Drive List
Global Physical Drive Settings
ID
Status
Model Number
Type
Location
Configuration
Media Capacity
1 HGST HUS726060AL SATA HDD Slot 1 Array0 No.0 6 TB
2 HGST HUS726060AL SATA HDD Slot 2 Array0 No.1 6 TB
3 Dead HGST HUS726060AL SATA HDD Slot 3 Array0 No.2 6 TB
4 HGST HUS726060AL SATA HDD Slot 4 Array0 No.3 6 TB
5 HGST HUS726060AL SATA HDD Slot 5 Array0 No.4 6 TB
6 HGST HUS726060AL SATA HDD Slot 6 Array0 No.5 6 TB
7 HGST HUS726060AL SATA HDD Slot 7 Array0 No.6 6 TB
8 HGST HUS726060AL SATA HDD Slot 8 Array0 No.7 6 TB
View
Locate
Settings
Clear
Click the lock to prevent further changes.

4. Right-click on the failed drive and select Locate.

WARNING: Make absolutely sure that you remove the correct drive as indicated in the steps below.

REMOVING THE WRONG DRIVE CAN RESULT IN LOSS OF THE ARRAY AND ALL CONTENT STORED ON YOUR G-SPEED STUDIO XL.

5. The failed drive's LED will begin to blink in the G-SPEED Studio XL enclosure, making it easy to identify which drive needs to be replaced. Be certain to remove the correct drive, as removing the wrong drive could cause data loss.

NOTE: It is possible for the failed drive to be completely offline. In this case, the drive's activity LED will be entirely turned off, indicating the failed drive.

6. Remove the failed drive by pressing the release button and sliding the drive out of the enclosure.
7. Replace the failed drive with a new disk module and secure the module in place. Once the drive has spun up, the G-SPEED Studio Software Utility will indicate that the array is rebuilding. Rebuild time is approximately two hours per terabyte.

Once the rebuild is complete, G-SPEED Studio XL will be back to normal, protecting your valuable data with optimal efficiency.

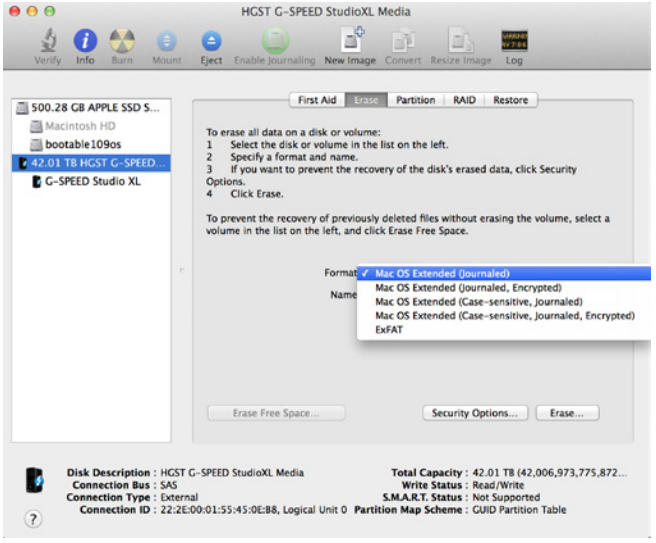
NOTE: Replacement and/or extra G-SPEED Studio XL disk modules are available for purchase online at: www.g-technology.com/products/g-speed-studio-raid

Initialize Drive for Mac®

Your G-SPEED Studio XL was factory-formatted ("initialized") for Mac OS® X. You can reinitialize either to quickly erase the contents of the drive or to reconfigure the RAID mode. Here are the steps:

1. First, open the Disk Utility program. This application is located on your hard drive under **Applications** > **Utilities** > **Disk Utility**. The window shown below will appear.

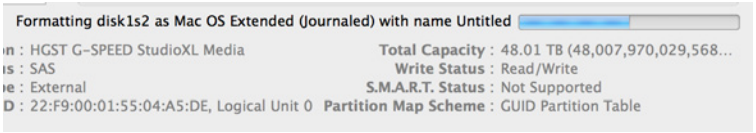
2. Select G-SPEED Studio XL by clicking its drive icon in the left column. Information about the drive will be displayed at the bottom of the window.
3. Select the Erase tab to view formatting options. Select Mac OS® Extended on the Format menu and enter "G-SPEED Studio XL" for the name.


HGST G-SPEED StudioXL Media
Verify
Info
Burn
Mount
Eject
Enable Journaling
New Image
Convert
Resize Image
Log
500.28 GB APPLE SSD S...
Macintosh HD
bootable109os
42.01 TB HGST G-SPEED...
G-SPEED Studio XL
First Aid
Erase
Partition
RAID
Restore
To erase all data on a disk or volume:
1 Select the disk or volume in the list on the left.
2 Specify a format and name.
3 If you want to prevent the recovery of the disk's erased data, click Security Options.
4 Click Erase.
To prevent the recovery of previously deleted files without erasing the volume, select a volume in the list on the left, and click Erase Free Space.
Format:
Name:
Mac OS Extended (Journaled)
Mac OS Extended (Journaled, Encrypted)
Mac OS Extended (Case-sensitive, Journaled)
Mac OS Extended (Case-sensitive, Journaled, Encrypted)
ExFAT
Erase Free Space...
Security Options...
Erase...
Disk Description : HGST G-SPEED StudioXL Media
Connection Bus : SAS
Connection Type : External
Connection ID : 22:2E:00:01:55:45:0E:B8, Logical Unit 0
Total Capacity : 42.01 TB (42,006,973,775,872...
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : GUID Partition Table

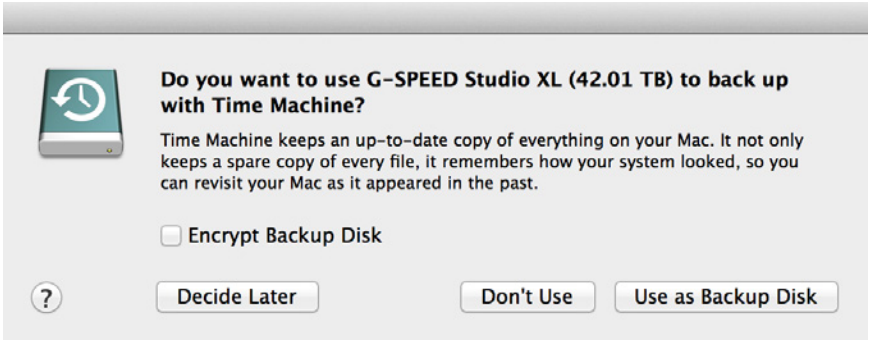
4. Click the Erase button in the lower-right corner of the window. A dialog box will appear asking if you want to erase the G-SPEED Studio XL partition.

WARNING: THIS NEXT STEP WILL ERASE ALL DATA ON YOUR DRIVE.

5. Click on the Erase button to continue. A progress bar in the lower-right corner of the window will show your reformatting progress.


Formatting disk1s2 as Mac OS Extended (Journaled) with name Untitled
n : HGST G-SPEED StudioXL Media
s : SAS
e : External
D : 22:F9:00:01:55:04:A5:DE, Logical Unit 0
Total Capacity : 48.01 TB (48,007,970,029,568...
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : GUID Partition Table

6. After the drive is reinitialized, you should automatically see the Time Machine dialog box. Click the Don't Use button if you do not want to your G-SPEED Studio XL as a Time Machine backup target.


Do you want to use G-SPEED Studio XL (42.01 TB) to back up with Time Machine?
Time Machine keeps an up-to-date copy of everything on your Mac. It not only keeps a spare copy of every file, it remembers how your system looked, so you can revisit your Mac as it appeared in the past.
Encrypt Backup Disk
Decide Later
Don't Use
Use as Backup Disk

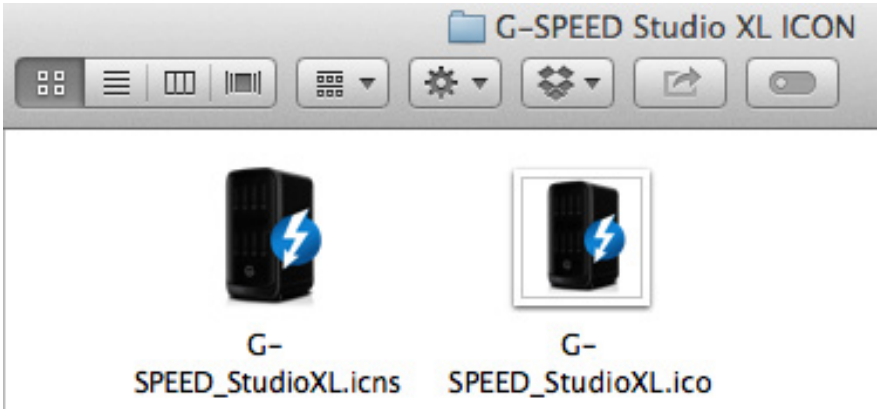
7. Quit Disk Utility: After reinitializing the drive, the custom icon for G-SPEED Studio XL will be erased. You can optionally restore this icon with the steps on the following page.

Restore the Drive Icon

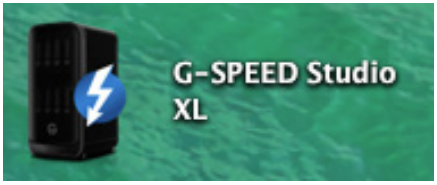
If your G-SPEED Studio XL drive icon was erased during the reinitializing process (see previous section), you can restore the icon with the following easy steps.

NOTE: This process is not required for G-SPEED Studio XL operation. However, it will make your drive's appearance on the computer desktop look more attractive and intuitive.

1. To get the G-SPEED Studio XL icon package, go to www.g-technology.com/support and navigate to your product. There will be a link to download the drive icon.
2. Once downloaded, double-click the ZIP file to open. Next, double-click the DMG file to open the G-Technology Icons package.
3. Click to select the drive icon for G-SPEED Studio XL in the package window. Press Command+C to copy the icon (see below).



4. Select the G-SPEED Studio XL icon on your desktop and press Command+I. This will open its Get Info window *(below left)*.
5. Select the default icon in the Get Info window *(below left)*.
6. Press Command+V to paste the G-SPEED Studio XL custom icon into the Get Info window (*below right)*.



7. The icon for your G-SPEED Studio XL will now be restored, and you can close the Get Info window. Your drive is fully ready for use!

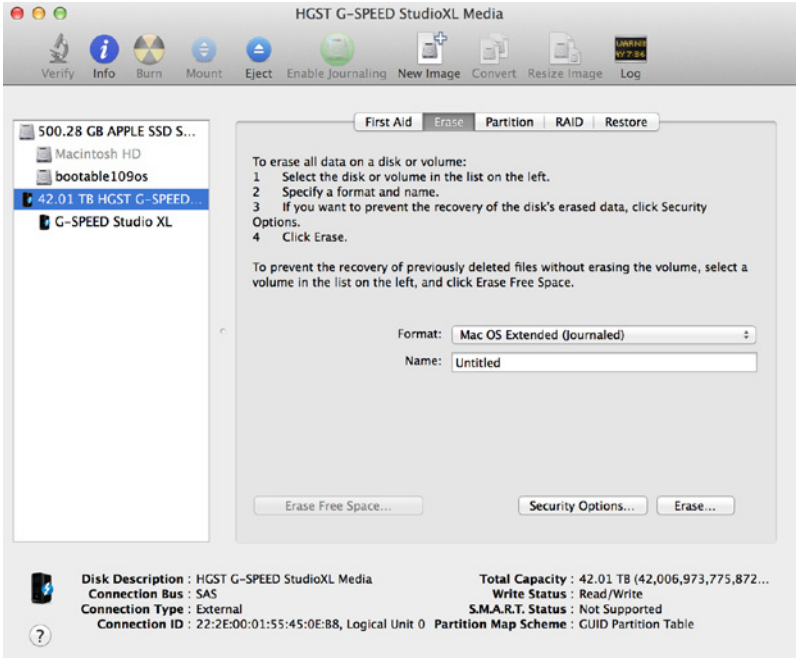
Reformat with Partitions

Hard drive partitioning is the process of dividing a hard drive into discrete sections called volumes. Each volume works like a separate disk. You can create up to 16 different partitions on a hard drive in OS X, and each partition can be a different size and format.

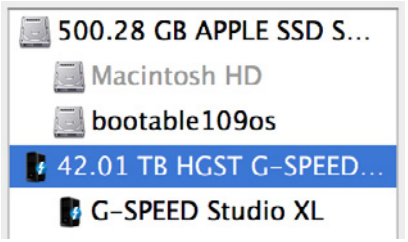
With hard drives getting bigger, it can be useful to partition your hard drive such that sections of its space can be used for different purposes. For instance, you might segment user data from backup data, set up a multi-boot environment with different operating systems or create a dedicated capture scratch disk for programs such as Final Cut Pro™.

The following steps will guide you through the simple process of partitioning your drive. In this example, we will partition a 42TB G-SPEED Studio XL connected via Thunderbolt.

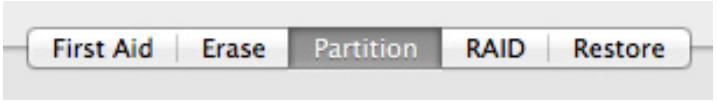
1. First, open **Disk Utility**. This application is located on your hard drive under **Applications** > **Utilities** > **Disk Utility**. The window shown below will appear. Your G-Technology drive will be displayed in the left column.


HGST G-SPEED StudioXL Media
Verify
Info
Burn
Mount
Eject
Enable Journaling
New Image
Convert
Resize Image
Log
500.28 GB APPLE SSD S...
Macintosh HD
bootable109os
42.01 TB HGST G-SPEED...
G-SPEED Studio XL
First Aid
Erase
Partition
RAID
Restore
To erase all data on a disk or volume:
1 Select the disk or volume in the list on the left.
2 Specify a format and name.
3 If you want to prevent the recovery of the disk's erased data, click Security Options.
4 Click Erase.
To prevent the recovery of previously deleted files without erasing the volume, select a volume in the list on the left, and click Erase Free Space.
Format:
Mac OS Extended (Journaled)
Name:
Untitled
Erase Free Space...
Security Options...
Erase...
Disk Description : HGST G-SPEED StudioXL Media
Connection Bus : SAS
Connection Type : External
Connection ID : 22:2E:00:01:55:45:0E:B8, Logical Unit 0
Total Capacity : 42.01 TB (42,006,973,775,872...
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : GUID Partition Table

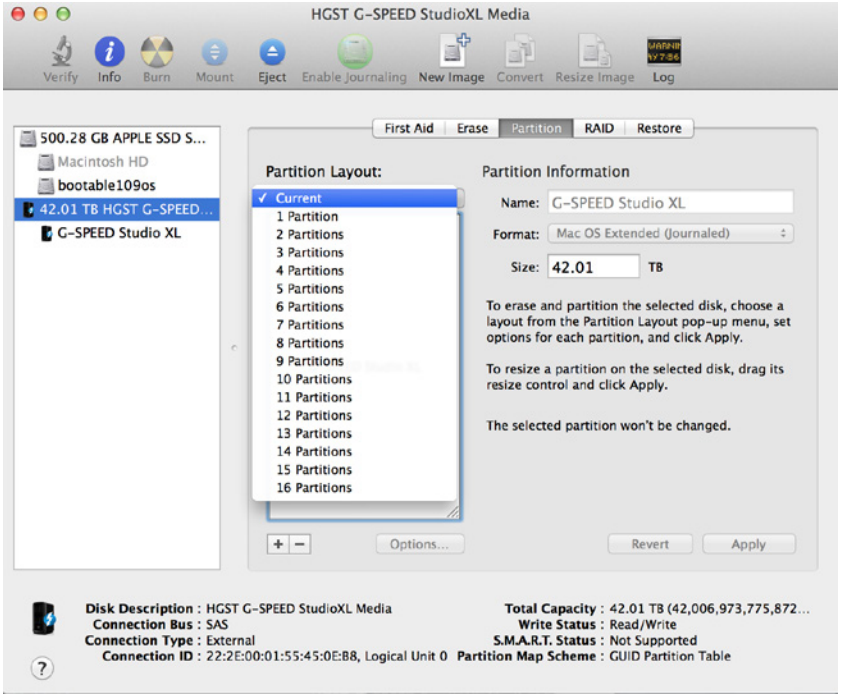
2. Select the appropriate icon — not the G-Technology drive icon — by clicking it in the left column.



3. Click on the **Partition** button in the main window.

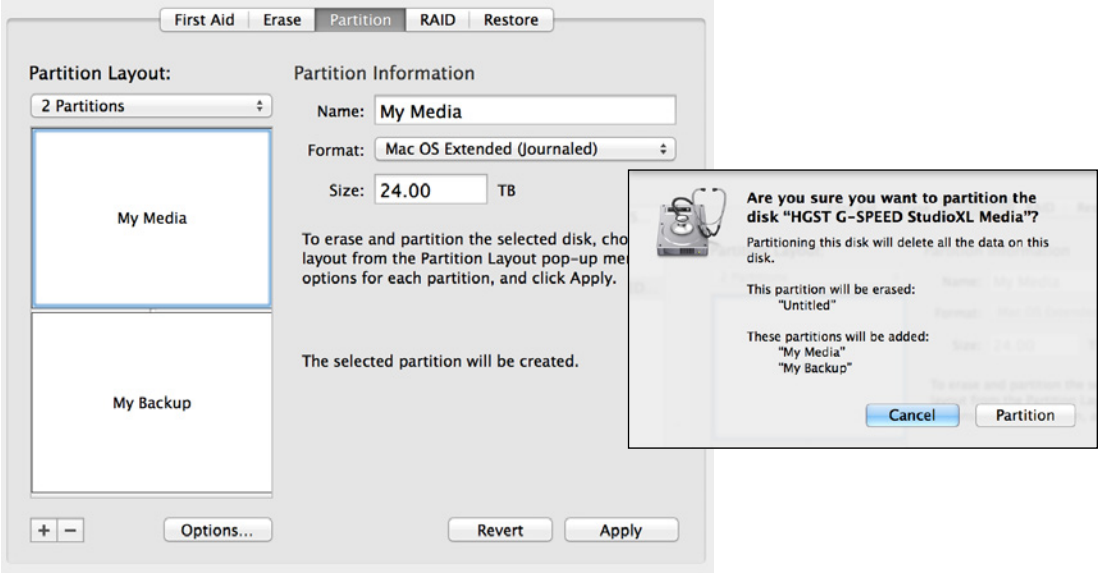


4. Select the number of partitions you would like from the Volume Scheme menu. Below, we have selected "2 Partitions" to create two partitions.

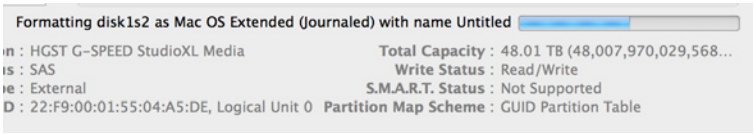


5. Click on the first partition in the Volume Scheme area. Your partition will be highlighted by a blue bounding box.
   - In the Name field, type a name for the partition.
   - From the Format menu, choose your desired disk format. If you will use your drive primarily on Mac OS® X, it is recommended to use Mac OS® Extended or Mac OS® Extended (Journaled).
   - In the Size field, type in a size for the partition. Alternately, you can drag the bar between each partition to quickly change partition sizes.
6. Repeat this process for each partition you have created.
7. Click the **Apply** button in the lower-right corner of the window. A dialog box will appear asking if you want to erase the G-Technology drive partition.

WARNING: THIS NEXT STEP WILL ERASE ALL DATA ON YOUR DRIVE.



8. Click on the **Partition** button to continue. A progress bar in the lower-right corner of the window will show you the disk's reformatting progress.


Formatting disk1s2 as Mac OS Extended (Journaled) with name Untitled
n : HGST G-SPEED StudioXL Media
s : SAS
e : External
D : 22:F9:00:01:55:04:A5:DE, Logical Unit 0
Total Capacity : 48.01 TB (48,007,970,029,568...
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : GUID Partition Table

9. When partitioning is complete, the multiple partitions will be displayed in the Disk Utility's left panel.
10. Quit Disk Utility: After reinitializing the drive, the custom icon for the G-Technology drive will have been erased. You can optionally restore this icon to each partition with the steps on this page.

11. The multiple partitions of your G-Technology drive will be displayed on the desktop. Your drive is now set up with two or more partitions and is ready for use.

G|SPEED® STUDIO XL
with Thunderbolt™

Appendix

• RAID Levels Explained ..... p. 113

G-Technology®

RAID Levels Explained

RAID Level	Description	Advantage	Disadvantage	Ideal for
0	Disk stripping	Offers the highest performance and a 100% of total available storage capacity	No fault tolerance – failure of one drive in the array results in complete data loss	Content creation applications requiring highest performance and storage capacity
1	Mirroring	Maximum level of data protection: identical data is written to multiple drives	Usable storage space is 50% of total available capacity	Applications in which data security is paramount
1E	Stripped Mirror: A RAID 1E array can be built from three or more disk drives.	Similar to a RAID 1 array except that data is both mirrored *and* striped, and more disk drives can be included.	Usable storage space is 50% of total available capacity	Applications in which data security is paramount and additional performance is needed
5 (Pre-configured)	Disk stripping with distributed parity	High read performance, medium write performance with data protection in case of a drive failure	Usable storage capacity equals total capacity of all drives in the array less the capacity of one drive	Content creation applications requiring data protection and performance
10	Built from two or more equal-sized RAID 1 arrays	Mirroring provides data protection, and striping improves performance	Usable storage space is 50% of total available capacity	Content Backup and Content creation applications with data protection
JBOD	Just-a-bunch-of-disks	Each drive can be accessed as an individual volume. Usable storage capacity is 100% of total available storage	No fault tolerance	Audio applications

G|SPEED® STUDIO XL
with Thunderbolt™

Support & Warranty

- Technical Support ..... p. 115
- Limited Warranty ..... p. 116
- Copyright ..... p. 118

G-Technology®

Technical Support

Thank you for purchasing G-SPEED Studio XL. If you have any comments or questions about this manual or the product, please let us know!

G-Technology appreciates and values its customers. We strive to give you the finest service and support. If you encounter any difficulties while installing or using your G-SPEED Studio XL, please contact G-Technology Technical Support at:

www.g-technology.com/contact/contact_support

Helpful information for support

When contacting Technical Support, it's best to be in front of your computer and have the following information available:

- Your G-SPEED Studio XL serial number (on bottom of unit)
- Operating System and version
- Computer model
- List of other devices attached to your computer

Limited Warranty

HGST, a Western Digital Company ("HGST") including G-Technology for External Hard Disk Drives

What does this limited warranty cover?

This limited warranty applies to new HGST products purchased from an authorized HGST dealer by the original purchaser for normal use and not for resale. HGST warrants that a covered product is free from defects in materials and workmanship, with the exceptions stated below.

How long does limited warranty coverage last?

This limited warranty lasts for one year, two years, three years, or five years, or a fixed period from date of purchase, depending on when and where it was originally purchased. To determine the warranty specifically for your product, visit **www.g-technology.com**. A valid proof of purchase may be required to prove eligibility. If you do not have a valid proof of purchase, the limited warranty period will be measured from the date of sale from HGST to the authorized distributor.

What does this limited warranty not cover?

The limited warranty does not cover damage resulting from commercial use, misuse, accident, modification or alteration to hardware or software, tampering, unsuitable physical or operating environment beyond product specifications, improper maintenance, or failure caused by a product for which HGST is not responsible.

There is no warranty of uninterrupted or error-free operation. There is no warranty for loss of data — you must regularly back up the data stored on your product to a separate storage product. There is no warranty for product with removed or altered identification labels.

HGST DOES NOT PROVIDE ANY OTHER WARRANTIES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME JURISDICTIONS DO NOT ALLOW THE LIMITATION OF IMPLIED WARRANTIES, SO THIS LIMITATION MAY NOT APPLY TO YOU. (HGST is not responsible for returning to you a product that is not covered by this limited warranty.)

What must you do?

If you are having trouble with a product, before seeking limited warranty service, first follow the troubleshooting procedures that HGST or your reseller provides.

To obtain limited warranty service, you must first obtain a Return Materials Authorization (RMA) and ship-to address by contacting G-Technology at **www.g-technology.com/support**. Please follow the instructions found on this website. You must return the covered hard disk drive using approved packaging to our logistics center. You must pay any associated transportation charges, duties, and

insurance in shipping the drive to our logistics center. You should remove all personal information from the product prior to its return.

What will HGST do?

HGST will replace the drive with a functionally equivalent replacement product, transportation prepaid. HGST may replace your product with a product that was previously used, repaired, and tested to meet HGST specifications. You receive tile to the replaced product at delivery to carrier at HGST's shipping point. You are responsible for importation of the replaced product, if applicable. HGST will not return the original drive to consumers; therefore, the consumer is responsible for moving data to another media before returning. Data recovery is not covered under this warranty and is not part of the warranty returns process. HGST warrants that replaced products are covered for the remainder of the original product warranty or 90 days, whichever is greater.

How is our liability limited?

HGST AND ITS AFFILIATES, SUPPLIERS, DISTRIBUTORS AND RESELLERS ARE NOT LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN BODILY INJURY INCLUDING DEATH AND TANGIBLE PERSONAL PROPERTY, 2) LOSS OF, OR DAMAGE TO, YOUR DATA; OR 3) SPECIAL, INCIDENTAL OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS OR SAVINGS), EVEN IF INFORMED OF THE POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW LIMITATION OF LIABILITY, INCIDENTAL DAMAGES OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

How do local laws apply?

THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS THAT VARY FROM JURISDICTION TO JURISDICTION.

Capacity Definition and Disclaimer

For G-Technology products 1TB or greater: 1 gigabyte (GB) is equal to 1 billion bytes and 1 terabyte (TB) equals 1,000 GB (1 trillion bytes). Accessible capacity will vary from the stated capacity due to formatting and partitioning of the hard drive, the computer's operating system, and other factors.

For G-Technology products less than 1TB: One gigabyte (GB) is equal to 1 billion bytes when referring to hard drive capacity. Accessible capacity will vary depending on the operating environment and formatting.

Copyright

Visit G-TECHNOLOGY.com for more information on G-TECHNOLOGY products. Information regarding products, services and offerings may be superseded by subsequent documents and are subject to change without notice. For the latest information and specifications regarding G-Technology Technology, Inc. and any of its offerings or services, please contact your local G-Technology office or the corporate headquarters. Thunderbolt and the Thunderbolt logo are trademarks of Intel Corporation in the U.S. and/or other countries. Design by G-Technology in California. G-SPEED, G-Technology and the G-Technology logo are registered trademarks of HGST, Inc. and its affiliates in the U.S. and other countries. Apple, Mac, MacBook Pro, Time Machine and the Mac logo are trademarks of Apple, Inc. Microsoft, Windows, Windows Vista and Windows XP are trademarks or registered trademarks of Microsoft Corporation in the US and/or other countries. Other trademarks are the property of their respective owners.

©2014 G-Technology, a division of HGST, Inc. All rights reserved.

g-technology.com

One GB is equal to one billion bytes and one TB equals 1,000 GB (one trillion bytes) when referring to hard drive capacity. Accessible capacity will vary from the stated capacity due to formatting and partitioning of the hard drive, the computer's operating system, and other factors. Thunderbolt and the Thunderbolt logo are trademarks of Intel Corporation in the U.S. and/or other countries.

Design by G-Technology in California. G-SPEED, G-Technology and the G-Technology logo are registered trademarks of HGST, Inc. and its affiliates in the U.S. and other countries. Apple, Mac, MacBook Pro, Time Machine and the Mac logo are trademarks of Apple, Inc. Microsoft, Windows, Windows Vista and Windows XP are trademarks or registered trademarks of Microsoft Corporation in the US and/or other countries. Other trademarks are the property of their respective owners. ©2014 G-Technology, a division of HGST, Inc. All rights reserved. R0 11/14